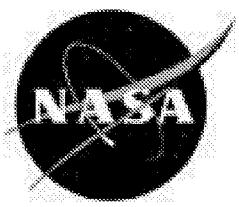
NASA/SP—2000–7037/SUPPL418
August 2000

AERONAUTICAL ENGINEERING

A CONTINUING BIBLIOGRAPHY WITH INDEXES



National Aeronautics and
Space Administration
Langley Research Center
**Scientific and Technical
Information Program Office**

The NASA STI Program Office . . . in Profile

Since its founding, NASA has been dedicated to the advancement of aeronautics and space science. The NASA Scientific and Technical Information (STI) Program Office plays a key part in helping NASA maintain this important role.

The NASA STI Program Office is operated by Langley Research Center, the lead center for NASA's scientific and technical information. The NASA STI Program Office provides access to the NASA STI Database, the largest collection of aeronautical and space science STI in the world. The Program Office is also NASA's institutional mechanism for disseminating the results of its research and development activities. These results are published by NASA in the NASA STI Report Series, which includes the following report types:

- TECHNICAL PUBLICATION. Reports of completed research or a major significant phase of research that present the results of NASA programs and include extensive data or theoretical analysis. Includes compilations of significant scientific and technical data and information deemed to be of continuing reference value. NASA's counterpart of peer-reviewed formal professional papers but has less stringent limitations on manuscript length and extent of graphic presentations.

- TECHNICAL MEMORANDUM. Scientific and technical findings that are preliminary or of specialized interest, e.g., quick release reports, working papers, and bibliographies that contain minimal annotation. Does not contain extensive analysis.

- CONTRACTOR REPORT. Scientific and technical findings by NASA-sponsored contractors and grantees.

- CONFERENCE PUBLICATION. Collected papers from scientific and technical conferences, symposia, seminars, or other meetings sponsored or cosponsored by NASA.

- SPECIAL PUBLICATION. Scientific, technical, or historical information from NASA programs, projects, and missions, often concerned with subjects having substantial public interest.

- TECHNICAL TRANSLATION. English-language translations of foreign scientific and technical material pertinent to NASA's mission.

Specialized services that complement the STI Program Office's diverse offerings include creating custom thesauri, building customized databases, organizing and publishing research results . . . even providing videos.

For more information about the NASA STI Program Office, see the following:

- Access the NASA STI Program Home Page at ***http://www.sti.nasa.gov***

- E-mail your question via the Internet to help@sti.nasa.gov

- Fax your question to the NASA STI Help Desk at (301) 621-0134

- Telephone the NASA STI Help Desk at (301) 621-0390

- Write to:
  NASA STI Help Desk
  NASA Center for AeroSpace Information
  7121 Standard Drive
  Hanover, MD 21076-1320

Introduction

This supplemental issue of *Aeronautical Engineering, A Continuing Bibliography with Indexes* (NASA/SP—2000-7037) lists reports, articles, and other documents recently announced in the NASA STI Database.

The coverage includes documents on the engineering and theoretical aspects of design, construction, evaluation, testing, operation, and performance of aircraft (including aircraft engines) and associated components, equipment, and systems. It also includes research and development in aerodynamics, aeronautics, and ground support equipment for aeronautical vehicles.

Each entry in the publication consists of a standard bibliographic citation accompanied, in most cases, by an abstract.

The NASA CASI price code table, addresses of organizations, and document availability information are included before the abstract section.

Two indexes—subject and author are included after the abstract section.

SCAN Goes Electronic!

If you have electronic mail or if you can access the Internet, you can view biweekly issues of *SCAN* from your desktop absolutely free!

Electronic SCAN takes advantage of computer technology to inform you of the latest worldwide, aerospace-related, scientific and technical information that has been published.

No more waiting while the paper copy is printed and mailed to you. You can view *Electronic SCAN* the same day it is released—up to 191 topics to browse at your leisure. When you locate a publication of interest, you can print the announcement. You can also go back to the *Electronic SCAN* home page and follow the ordering instructions to quickly receive the full document.

Start your access to *Electronic SCAN* today. Over 1,000 announcements of new reports, books, conference proceedings, journal articles...and more—available to your computer every two weeks.

For Internet access to *E-SCAN*, use any of the following addresses:

http://www.sti.nasa.gov
ftp.sti.nasa.gov
gopher.sti.nasa.gov

To receive a free subscription, send e-mail for complete information about the service first. Enter **scan@sti.nasa.gov** on the address line. Leave the subject and message areas blank and send. You will receive a reply in minutes.

Then simply determine the SCAN topics you wish to receive and send a second e-mail to **listserv@sti.nasa.gov**. Leave the subject line blank and enter a subscribe command, denoting which topic you want and your name in the message area, formatted as follows:

Subscribe SCAN–02–01 Jane Doe

For additional information, e-mail a message to **help@sti.nasa.gov**.

Phone: (301) 621-0390

Fax: (301) 621-0134

Write: NASA STI Help Desk
NASA Center for AeroSpace Information
7121 Standard Drive
Hanover, MD 21076-1320

Looking just for *Aerospace Medicine and Biology* reports?

Although hard copy distribution has been discontinued, you can still receive these vital announcements through your *E-SCAN* subscription. Just **Subscribe SCAN-AEROMED Jane Doe** in the message area of your e-mail to **listserv@sti.nasa.gov**.

Table of Contents

Records are arranged in categories 1 through 19, the first nine coming from the Aeronautics division of *STAR*, followed by the remaining division titles. Selecting a category will link you to the collection of records cited in this issue pertaining to that category.

01 Aeronautics (General) 1

Includes general research topics related to manned and unmanned aircraft and the problems of flight within the Earth's atmosphere. Also includes manufacturing, maintenance, and repair of aircraft.

02 Aerodynamics 3

Includes aerodynamics of flight vehicles, test bodies, airframe components and combinations, wings, and control surfaces. Also includes aerodynamics of rotors, stators, fans and other elements of turbomachinery.

03 Air Transportation and Safety 7

Includes passenger and cargo air transport operations; aircraft ground operations; flight safety and hazards; and aircraft accidents. Systems and hardware specific to ground operations of aircraft and to airport construction are covered in *09 Research and Support Facilities (Air)*. Air traffic control is covered in *04 Aircraft Communications and Navigation*.

04 Aircraft Communications and Navigation 16

Includes all modes of communication with and between aircraft; air navigation systems (satellite and ground based); and air traffic control.

05 Aircraft Design, Testing and Performance 19

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance, and evaluation, and aircraft and flight simulation technology.

08 Aircraft Stability and Control 27

Includes flight dynamics, aircraft handling qualities; piloting; flight controls; and autopilots. For related information, see also *05 Aircraft Design, Testing and Performance* and *06 Avionics and Aircraft Instrumentation*.

09 Research and Support Facilities (Air) 29

Includes airports, runways, hangers, and aircraft repair and overhaul facilities, wind tunnels, water tunnels, and shock tubes; flight simulators; and aircraft engine test stands. Also includes airport ground equipment and systems. For airport ground operation see *03 Air Transportation and Safety*.

10 Astronautics (General) 29

Includes general research topics related to space flight and manned and unmanned space vehicles, platforms or objects launched into, or assembled in, outer space; and related components and equipment. Also includes manufacturing and maintenance of such vehicles or platforms.

11 Chemistry and Materials (General) 31
Includes general research topics related to the composition, properties, structure, and use of chemical compounds and materials as they relate to aircraft, launch vehicles, and spacecraft.

12 Engineering (General) 31
Includes general research topics to engineering and applied physics, and particular areas of vacuum technology, industrial engineering, cryogenics, and fire prevention.

13 Geosciences (General) 33
Includes general research topics related to the Earth sciences, and the specific areas of petrology, minerology, and general geology.

14 Life Sciences (General) 35
Includes general research topics related to plant and animal biology (non–human); ecology; microbiology; and also the origin, development, structure, and maintenance, of animals and plants in space and related environmental conditions.

15 Mathematical and Computer Sciences (General) 36
Includes general topics and overviews related to mathematics and computer science.

16 Physics (General) 37
Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics.

17 Social and Information Sciences (General) 38
Includes general research topics related to sociology; educational programs and curricula.

19 General 40
Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs such as Apollo, Gemini, and Mercury spacecraft, Earth Resources Technology Satellite (ERTS), and Skylab; NASA appropriations hearings.

Indexes

Two indexes are available. You may use the find command under the tools menu while viewing the PDF file for direct match searching on any text string. You may also view the indexes provided, for searching on *NASA Thesaurus* subject terms and author names.

Subject Term Index ST–1
Author Index PA–1

Selecting an index above will link you to that comprehensive listing.

Document Availability

Select Availability Info for important information about NASA Scientific and Technical Information (STI) Program Office products and services, including registration with the NASA Center for AeroSpace Information (CASI) for access to the NASA CASI TRS (Technical Report Server), and availability and pricing information for cited documents.

The New NASA Video Catalog is Here

Free!

To order your copy,
call the NASA STI Help Desk at
(301) 621-0390,
fax to
(301) 621-0134,
e-mail to
help@sti.nasa.gov,
or visit the NASA STI Program
homepage at
http://www.sti.nasa.gov

(Select STI Program Bibliographic Announcements)

Explore the Universe!

Document Availability Information

The mission of the NASA Scientific and Technical (STI) Program Office is to quickly, efficiently, and cost-effectively provide the NASA community with desktop access to STI produced by NASA and the world's aerospace industry and academia. In addition, we will provide the aerospace industry, academia, and the taxpayer access to the intellectual scientific and technical output and achievements of NASA.

Eligibility and Registration for NASA STI Products and Services

The NASA STI Program offers a wide variety of products and services to achieve its mission. Your affiliation with NASA determines the level and type of services provided by the NASA STI Program. To assure that appropriate level of services are provided, NASA STI users are requested to register at the NASA Center for AeroSpace Information (CASI). Please contact NASA CASI in one of the following ways:

E-mail:	help@sti.nasa.gov
Fax:	301-621-0134
Phone:	301-621-0390
Mail:	ATTN: Registration Services NASA Center for AeroSpace Information 7121 Standard Drive Hanover, MD 21076-1320

Limited Reproducibility

In the database citations, a note of limited reproducibility appears if there are factors affecting the reproducibility of more than 20 percent of the document. These factors include faint or broken type, color photographs, black and white photographs, foldouts, dot matrix print, or some other factor that limits the reproducibility of the document. This notation also appears on the microfiche header.

NASA Patents and Patent Applications

Patents owned by NASA are announced in the STI Database. Printed copies of patents (which are not microfiched) are available for purchase from the U.S. Patent and Trademark Office.

When ordering patents, the U.S. Patent Number should be used, and payment must be remitted in advance, by money order or check payable to the Commissioner of Patents and Trademarks. Prepaid purchase coupons for ordering are also available from the U.S. Patent and Trademark Office.

Patents and patent applications owned by NASA are available for licensing. Requests for licensing terms and further information should be addressed to:

National Aeronautics and Space Administration
Associate General Counsel for Intellectual Property

Code GP
Washington, DC 20546-0001

Sources for Documents

One or more sources from which a document announced in the STI Database is available to the public is ordinarily given on the last line of the citation. The most commonly indicated sources and their acronyms or abbreviations are listed below, with an Addresses of Organizations list near the back of this section. If the publication is available from a source other than those listed, the publisher and his address will be displayed on the availability line or in combination with the corporate source.

Avail: NASA CASI. Sold by the NASA Center for AeroSpace Information. Prices for hard copy (HC) and microfiche (MF) are indicated by a price code following the letters HC or MF in the citation. Current values are given in the NASA CASI Price Code Table near the end of this section.

Note on Ordering Documents: When ordering publications from NASA CASI, use the document ID number or other report number. It is also advisable to cite the title and other bibliographic identification.

Avail: SOD (or GPO). Sold by the Superintendent of Documents, U.S. Government Printing Office, in hard copy.

Avail: BLL (formerly NLL): British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England. Photocopies available from this organization at the price shown. (If none is given, inquiry should be addressed to the BLL.)

Avail: DOE Depository Libraries. Organizations in U.S. cities and abroad that maintain collections of Department of Energy reports, usually in microfiche form, are listed in Energy Research Abstracts. Services available from the DOE and its depositories are described in a booklet, *DOE Technical Information Center—Its Functions and Services* (TID-4660), which may be obtained without charge from the DOE Technical Information Center.

Avail: ESDU. Pricing information on specific data, computer programs, and details on ESDU International topic categories can be obtained from ESDU International.

Avail: Fachinformationszentrum Karlsruhe. Gesellschaft für wissenschaftlich-technische Information mbH 76344 Eggenstein-Leopoldshafen, Germany.

Avail: HMSO. Publications of Her Majesty's Stationery Office are sold in the U.S. by Pendragon House, Inc. (PHI), Redwood City, CA. The U.S. price (including a service and mailing charge) is given, or a conversion table may be obtained from PHI.

Avail: Issuing Activity, or Corporate Author, or no indication of availability. Inquiries as to the availability of these documents should be addressed to the organization shown in the citation as the corporate author of the document.

Avail: NASA Public Document Rooms. Documents so indicated may be examined at or purchased from the National Aeronautics and Space Administration (JBD-4), Public Documents Room (Room 1H23), Washington, DC 20546-0001, or public document rooms located at NASA installations, and the NASA Pasadena Office at the Jet Propulsion Laboratory.

Avail: NTIS. Sold by the National Technical Information Service. Initially distributed microfiche under the NTIS SRIM (Selected Research in Microfiche) are available. For information concerning this service, consult the NTIS Subscription Section, Springfield, VA 22161.

Avail: Univ. Microfilms. Documents so indicated are dissertations selected from Dissertation Abstracts and are sold by University Microfilms as xerographic copy (HC) and microfilm. All requests should cite the author and the Order Number as they appear in the citation.

Avail: US Patent and Trademark Office. Sold by Commissioner of Patents and Trademarks, U.S. Patent and Trademark Office, at the standard price of $1.50 each, postage free.

Avail: (US Sales Only). These foreign documents are available to users within the United States from the National Technical Information Service (NTIS). They are available to users outside the United States through the International Nuclear Information Service (INIS) representative in their country, or by applying directly to the issuing organization.

Avail: USGS. Originals of many reports from the U.S. Geological Survey, which may contain color illustrations, or otherwise may not have the quality of illustrations preserved in the microfiche or facsimile reproduction, may be examined by the public at the libraries of the USGS field offices whose addresses are listed on the Addresses of Organizations page. The libraries may be queried concerning the availability of specific documents and the possible utilization of local copying services, such as color reproduction.

Addresses of Organizations

British Library Lending Division
Boston Spa, Wetherby, Yorkshire
England

Commissioner of Patents and Trademarks
U.S. Patent and Trademark Office
Washington, DC 20231

Department of Energy
Technical Information Center
P.O. Box 62
Oak Ridge, TN 37830

European Space Agency–
Information Retrieval Service ESRIN
Via Galileo Galilei
00044 Frascati (Rome) Italy

ESDU International
27 Corsham Street
London
N1 6UA
England

Fachinformationszentrum Karlsruhe
Gesellschaft für wissenschaftlich–technische
Information mbH
76344 Eggenstein–Leopoldshafen, Germany

Her Majesty's Stationery Office
P.O. Box 569, S.E. 1
London, England

NASA Center for AeroSpace Information
7121 Standard Drive
Hanover, MD 21076-1320

(NASA STI Lead Center)
National Aeronautics and Space Administration
Scientific and Technical Information Program Office
Langley Research Center – MS157
Hampton, VA 23681

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161

Pendragon House, Inc.
899 Broadway Avenue
Redwood City, CA 94063

Superintendent of Documents
U.S. Government Printing Office
Washington, DC 20402

University Microfilms
A Xerox Company
300 North Zeeb Road
Ann Arbor, MI 48106

University Microfilms, Ltd.
Tylers Green
London, England

U.S. Geological Survey Library National Center
MS 950
12201 Sunrise Valley Drive
Reston, VA 22092

U.S. Geological Survey Library
2255 North Gemini Drive
Flagstaff, AZ 86001

U.S. Geological Survey
345 Middlefield Road
Menlo Park, CA 94025

U.S. Geological Survey Library
Box 25046
Denver Federal Center, MS914
Denver, CO 80225

NASA CASI Price Tables — Effective January 1, 2000

Hardcopy & Microfiche Prices

Code	*NASA*	*U.S.**	*International**
A01	$9.50	$9.50	$19.00
A02	$13.50	$14.50	$29.00
A03	$24.50	$27.50	$55.00
A04	$27.00	$30.50	$61.00
A05	$28.50	$32.50	$65.00
A06	$31.00	$35.50	$71.00
A07	$34.50	$39.50	$79.00
A08	$37.50	$43.00	$86.00
A09	$42.50	$49.00	$98.00
A10	$45.50	$53.00	$106.00
A11	$48.50	$56.50	$113.00
A12	$52.50	$61.00	$122.00
A13	$55.50	$65.00	$130.00
A14	$57.50	$67.00	$134.00
A15	$59.50	$69.50	$139.00
A16	$61.50	$72.00	$144.00
A17	$63.50	$74.50	$149.00
A18	$67.00	$78.50	$157.00
A19	$69.00	$81.00	$162.00
A20	$71.00	$83.50	$167.00
A21	$73.00	$86.00	$172.00
A22	$78.50	$92.50	$185.00
A23	$80.50	$95.00	$190.00
A24	$82.50	$97.00	$194.00
A25	$84.50	$99.50	$199.00
A99	Contact NASA CASI		

Exception Prices

Code	*NASA*	*U.S.**	*International**
E01	$102.50	$121.00	$242.00
E02	$111.00	$131.50	$263.00
E03	$120.50	$143.00	$286.00
E04	$130.00	$154.00	$308.00
E05	$139.50	$165.50	$331.00
E06	$148.00	$176.00	$352.00
E07	$157.50	$187.00	$374.00
E08	$167.00	$198.50	$397.00
E09	$175.50	$209.00	$418.00
E10	$185.00	$220.00	$440.00
E11	$194.50	$231.50	$463.00
E12	$202.50	$241.00	$482.00
E13	$212.00	$252.50	$505.00
E14	$221.50	$264.00	$528.00
E15	$231.00	$275.50	$551.00
E16	$239.50	$285.50	$571.00
E17	$249.00	$297.00	$594.00
E18	$258.50	$308.50	$617.00
E19	$267.00	$318.50	$637.00
E20	$276.50	$330.00	$660.00
E21	$286.00	$341.50	$683.00
E22	$294.50	$351.50	$703.00
E23	$304.00	$363.00	$726.00
E24	$313.50	$374.50	$749.00
E99	Free	Free	Free

NASA Prices:

For NASA employees and contractors registered at NASA CASI.

*U.S. Prices: *Shipping fees extra*

For users located within the U.S.

*International Prices: *Shipping fees extra*

For users outside the U.S. and international within the U.S. embassies

Service Fees

Shipping Fees: per item

$1.50 U.S.
$9.00 International

Video Shipping Fees: per title

$3.50 U.S.
$11.00 International

Express Service Surcharge: per item

One day CASI processing & shipped FedEX or Airmail.
*This charge is in addition to the shipping fee.

$15.00 U.S.
$30.00 International

Fax Service Fees: per item up to 30 pages

$16.50 U.S.
$24.00 International

Video Prices (VHS)

Code	*NASA*	*U.S.**	*International**
V01	$19.50	$20.00	$40.00
V02	$23.50	$25.00	$50.00
V03	$31.50	$35.00	$70.00
V04	$39.50	$45.00	$90.00
V05	$47.50	$55.00	$110.00
V06	$55.50	$65.00	$130.00
V07	$63.50	$75.00	$150.00
V08	$71.50	$85.00	$170.00

Video Prices (Betacam SP) NTSC

Code	*NASA*	*U.S.**	*International**
B01	$71.50	$85.00	$170.00
B02	$75.50	$90.00	$180.00
B03	$83.50	$100.00	$200.00
B04	$119.50	$145.00	$290.00
B05	$135.50	$165.00	$330.00
B06	$171.50	$210.00	$420.00
B07	$207.50	$255.00	$510.00
B08	$243.50	$300.00	$600.00

Video Prices (Betacam SP) PAL

Code	*NASA*	*U.S.**	*International**
B01	$98.50	$119.00	$238.00
B02	$164.50	$201.00	$402.00
B03	$186.50	$229.00	$458.00
B04	$223.50	$275.00	$550.00
B05	$230.50	$284.00	$568.00
B06	$237.50	$293.00	$586.00
B07	$244.50	$302.00	$604.00
B07	$252.50	$312.00	$624.00

CD-ROM Prices

Code	*NASA*	*U.S.**	*International**
C01	$28.00	$33.00	$66.00
C02	$36.50	$44.00	$88.00
C03	$46.50	$56.00	$112.00
C04	$54.00	$66.00	$132.00
C05	$63.00	$77.00	$154.00
C06	$72.00	$88.00	$176.00
C07	$80.50	$99.00	$198.00
C08	$90.50	$111.00	$222.00
C09	$99.00	$122.00	$244.00
C10	$108.00	$133.00	$266.00

NASA Prices:

For NASA employees and contractors registered at NASA CASI.

*U.S. Prices: *Shipping fees extra*

For users located within the U.S.

*International Prices: *Shipping fees extra*

For users outside the U.S. and international within the U.S. embassies

Service Fees

Shipping Fees: per item

$1.50 U.S.
$9.00 International

Video Shipping Fees: per title

$3.50 U.S.
$11.00 International

Express Service Surcharge: per item

One day CASI processing & shipped FedEX or Airmail.
*This charge is in addition to the shipping fee.

$15.00 U.S.
$30.00 International

Fax Service Fees: per item up to 30 pages

$16.50 U.S.
$24.00 International

Federal Depository Library Program

In order to provide the general public with greater access to U.S. Government publications, Congress established the Federal Depository Library Program under the Government Printing Office (GPO), with 53 regional depositories responsible for permanent retention of material, inter-library loan, and reference services. At least one copy of nearly every NASA and NASA-sponsored publication, either in printed or microfiche format, is received and retained by the 53 regional depositories. A list of the Federal Regional Depository Libraries, arranged alphabetically by state, appears at the very end of this section. These libraries are not sales outlets. A local library can contact a regional depository to help locate specific reports, or direct contact may be made by an individual.

Public Collection of NASA Documents

An extensive collection of NASA and NASA-sponsored publications is maintained by the British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England for public access. The British Library Lending Division also has available many of the non-NASA publications cited in the STI Database. European requesters may purchase facsimile copy or microfiche of NASA and NASA-sponsored documents FIZ–Fachinformation Karlsruhe–Bibliographic Service, D-76344 Eggenstein-Leopoldshafen, Germany and TIB–Technische Informationsbibliothek, P.O. Box 60 80, D-30080 Hannover, Germany.

Submitting Documents

All users of this abstract service are urged to forward reports to be considered for announcement in the STI Database. This will aid NASA in its efforts to provide the fullest possible coverage of all scientific and technical publications that might support aeronautics and space research and development. If you have prepared relevant reports (other than those you will transmit to NASA, DOD, or DOE through the usual contract- or grant-reporting channels), please send them for consideration to:

ATTN: Acquisitions Specialist
NASA Center for AeroSpace Information
7121 Standard Drive
Hanover, MD 21076-1320.

Reprints of journal articles, book chapters, and conference papers are also welcome.

You may specify a particular source to be included in a report announcement if you wish; otherwise the report will be placed on a public sale at the NASA Center for AeroSpace Information. Copyrighted publications will be announced but not distributed or sold.

Federal Regional Depository Libraries

ALABAMA

AUBURN UNIV. AT MONTGOMERY LIBRARY
Documents Dept.
7300 University Dr.
Montgomery, AL 36117–3596
(205) 244–3650 Fax: (205) 244–0678

UNIV. OF ALABAMA
Amelia Gayle Gorgas Library
Govt. Documents
P.O. Box 870266
Tuscaloosa, AL 35487–0266
(205) 348–6046 Fax: (205) 348–0760

ARIZONA

DEPT. OF LIBRARY, ARCHIVES, AND PUBLIC RECORDS
Research Division
Third Floor, State Capitol
1700 West Washington
Phoenix, AZ 85007
(602) 542–3701 Fax: (602) 542–4400

ARKANSAS

ARKANSAS STATE LIBRARY
State Library Service Section
Documents Service Section
One Capitol Mall
Little Rock, AR 72201–1014
(501) 682–2053 Fax: (501) 682–1529

CALIFORNIA

CALIFORNIA STATE LIBRARY
Govt. Publications Section
P.O. Box 942837 – 914 Capitol Mall
Sacramento, CA 94337–0091
(916) 654–0069 Fax: (916) 654–0241

COLORADO

UNIV. OF COLORADO – BOULDER
Libraries – Govt. Publications
Campus Box 184
Boulder, CO 80309–0184
(303) 492–8834 Fax: (303) 492–1881

DENVER PUBLIC LIBRARY
Govt. Publications Dept. BSG
1357 Broadway
Denver, CO 80203–2165
(303) 640–8846 Fax: (303) 640–8817

CONNECTICUT

CONNECTICUT STATE LIBRARY
231 Capitol Avenue
Hartford, CT 06106
(203) 566–4971 Fax: (203) 566–3322

FLORIDA

UNIV. OF FLORIDA LIBRARIES
Documents Dept.
240 Library West
Gainesville, FL 32611–2048
(904) 392–0366 Fax: (904) 392–7251

GEORGIA

UNIV. OF GEORGIA LIBRARIES
Govt. Documents Dept.
Jackson Street
Athens, GA 30602–1645
(706) 542–8949 Fax: (706) 542–4144

HAWAII

UNIV. OF HAWAII
Hamilton Library
Govt. Documents Collection
2550 The Mall
Honolulu, HI 96822
(808) 948–8230 Fax: (808) 956–5968

IDAHO

UNIV. OF IDAHO LIBRARY
Documents Section
Rayburn Street
Moscow, ID 83844–2353
(208) 885–6344 Fax: (208) 885–6817

ILLINOIS

ILLINOIS STATE LIBRARY
Federal Documents Dept.
300 South Second Street
Springfield, IL 62701–1796
(217) 782–7596 Fax: (217) 782–6437

INDIANA

INDIANA STATE LIBRARY
Serials/Documents Section
140 North Senate Avenue
Indianapolis, IN 46204–2296
(317) 232–3679 Fax: (317) 232–3728

IOWA

UNIV. OF IOWA LIBRARIES
Govt. Publications
Washington & Madison Streets
Iowa City, IA 52242–1166
(319) 335–5926 Fax: (319) 335–5900

KANSAS

UNIV. OF KANSAS
Govt. Documents & Maps Library
6001 Malott Hall
Lawrence, KS 66045–2800
(913) 864–4660 Fax: (913) 864–3855

KENTUCKY

UNIV. OF KENTUCKY
King Library South
Govt. Publications/Maps Dept.
Patterson Drive
Lexington, KY 40506–0039
(606) 257–3139 Fax: (606) 257–3139

LOUISIANA

LOUISIANA STATE UNIV.
Middleton Library
Govt. Documents Dept.
Baton Rouge, LA 70803–3312
(504) 388–2570 Fax: (504) 388–6992

LOUISIANA TECHNICAL UNIV.
Prescott Memorial Library
Govt. Documents Dept.
Ruston, LA 71272–0046
(318) 257–4962 Fax: (318) 257–2447

MAINE

UNIV. OF MAINE
Raymond H. Fogler Library
Govt. Documents Dept.
Orono, ME 04469–5729
(207) 581–1673 Fax: (207) 581–1653

MARYLAND

UNIV. OF MARYLAND – COLLEGE PARK
McKeldin Library
Govt. Documents/Maps Unit
College Park, MD 20742
(301) 405–9165 Fax: (301) 314–9416

MASSACHUSETTS

BOSTON PUBLIC LIBRARY
Govt. Documents
666 Boylston Street
Boston, MA 02117–0286
(617) 536–5400, ext. 226
Fax: (617) 536–7758

MICHIGAN

DETROIT PUBLIC LIBRARY
5201 Woodward Avenue
Detroit, MI 48202–4093
(313) 833–1025 Fax: (313) 833–0156

LIBRARY OF MICHIGAN
Govt. Documents Unit
P.O. Box 30007
717 West Allegan Street
Lansing, MI 48909
(517) 373–1300 Fax: (517) 373–3381

MINNESOTA

UNIV. OF MINNESOTA
Govt. Publications
409 Wilson Library
309 19th Avenue South
Minneapolis, MN 55455
(612) 624–5073 Fax: (612) 626–9353

MISSISSIPPI

UNIV. OF MISSISSIPPI
J.D. Williams Library
106 Old Gym Bldg.
University, MS 38677
(601) 232–5857 Fax: (601) 232–7465

MISSOURI

UNIV. OF MISSOURI – COLUMBIA
106B Ellis Library
Govt. Documents Sect.
Columbia, MO 65201–5149
(314) 882–6733 Fax: (314) 882–8044

MONTANA

UNIV. OF MONTANA
Mansfield Library
Documents Division
Missoula, MT 59812–1195
(406) 243–6700 Fax: (406) 243–2060

NEBRASKA

UNIV. OF NEBRASKA – LINCOLN
D.L. Love Memorial Library
Lincoln, NE 68588–0410
(402) 472–2562 Fax: (402) 472–5131

NEVADA

THE UNIV. OF NEVADA LIBRARIES
Business and Govt. Information Center
Reno, NV 89557–0044
(702) 784–6579 Fax: (702) 784–1751

NEW JERSEY

NEWARK PUBLIC LIBRARY
Science Div. – Public Access
P.O. Box 630
Five Washington Street
Newark, NJ 07101–7812
(201) 733–7782 Fax: (201) 733–5648

NEW MEXICO

UNIV. OF NEW MEXICO
General Library
Govt. Information Dept.
Albuquerque, NM 87131–1466
(505) 277–5441 Fax: (505) 277–6019

NEW MEXICO STATE LIBRARY
325 Don Gaspar Avenue
Santa Fe, NM 87503
(505) 827–3824 Fax: (505) 827–3888

NEW YORK

NEW YORK STATE LIBRARY
Cultural Education Center
Documents/Gift & Exchange Section
Empire State Plaza
Albany, NY 12230–0001
(518) 474–5355 Fax: (518) 474–5786

NORTH CAROLINA

UNIV. OF NORTH CAROLINA – CHAPEL HILL
Walter Royal Davis Library
CB 3912, Reference Dept.
Chapel Hill, NC 27514–8890
(919) 962–1151 Fax: (919) 962–4451

NORTH DAKOTA

NORTH DAKOTA STATE UNIV. LIB.
Documents
P.O. Box 5599
Fargo, ND 58105–5599
(701) 237–8886 Fax: (701) 237–7138

UNIV. OF NORTH DAKOTA
Chester Fritz Library
University Station
P.O. Box 9000 – Centennial and University Avenue
Grand Forks, ND 58202–9000
(701) 777–4632 Fax: (701) 777–3319

OHIO

STATE LIBRARY OF OHIO
Documents Dept.
65 South Front Street
Columbus, OH 43215–4163
(614) 644–7051 Fax: (614) 752–9178

OKLAHOMA

OKLAHOMA DEPT. OF LIBRARIES
U.S. Govt. Information Division
200 Northeast 18th Street
Oklahoma City, OK 73105–3298
(405) 521–2502, ext. 253
Fax: (405) 525–7804

OKLAHOMA STATE UNIV.
Edmon Low Library
Stillwater, OK 74078–0375
(405) 744–6546 Fax: (405) 744–5183

OREGON

PORTLAND STATE UNIV.
Branford P. Millar Library
934 Southwest Harrison
Portland, OR 97207–1151
(503) 725–4123 Fax: (503) 725–4524

PENNSYLVANIA

STATE LIBRARY OF PENN.
Govt. Publications Section
116 Walnut & Commonwealth Ave.
Harrisburg, PA 17105–1601
(717) 787–3752 Fax: (717) 783–2070

SOUTH CAROLINA

CLEMSON UNIV.
Robert Muldrow Cooper Library
Public Documents Unit
P.O. Box 343001
Clemson, SC 29634–3001
(803) 656–5174 Fax: (803) 656–3025

UNIV. OF SOUTH CAROLINA
Thomas Cooper Library
Green and Sumter Streets
Columbia, SC 29208
(803) 777–4841 Fax: (803) 777–9503

TENNESSEE

UNIV. OF MEMPHIS LIBRARIES
Govt. Publications Dept.
Memphis, TN 38152–0001
(901) 678–2206 Fax: (901) 678–2511

TEXAS

TEXAS STATE LIBRARY
United States Documents
P.O. Box 12927 – 1201 Brazos
Austin, TX 78701–0001
(512) 463–5455 Fax: (512) 463–5436

TEXAS TECH. UNIV. LIBRARIES
Documents Dept.
Lubbock, TX 79409–0002
(806) 742–2282 Fax: (806) 742–1920

UTAH

UTAH STATE UNIV.
Merrill Library Documents Dept.
Logan, UT 84322–3000
(801) 797–2678 Fax: (801) 797–2677

VIRGINIA

UNIV. OF VIRGINIA
Alderman Library
Govt. Documents
University Ave. & McCormick Rd.
Charlottesville, VA 22903–2498
(804) 824–3133 Fax: (804) 924–4337

WASHINGTON

WASHINGTON STATE LIBRARY
Govt. Publications
P.O. Box 42478
16th and Water Streets
Olympia, WA 98504–2478
(206) 753–4027 Fax: (206) 586–7575

WEST VIRGINIA

WEST VIRGINIA UNIV. LIBRARY
Govt. Documents Section
P.O. Box 6069 – 1549 University Ave.
Morgantown, WV 26506–6069
(304) 293–3051 Fax: (304) 293–6638

WISCONSIN

ST. HIST. SOC. OF WISCONSIN LIBRARY
Govt. Publication Section
816 State Street
Madison, WI 53706
(608) 264–6525 Fax: (608) 264–6520

MILWAUKEE PUBLIC LIBRARY
Documents Division
814 West Wisconsin Avenue
Milwaukee, WI 53233
(414) 286–3073 Fax: (414) 286–8074

Typical Report Citation and Abstract

❶ 19970001126 NASA Langley Research Center, Hampton, VA USA
❷ **Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes**
❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
❹ Mar. 1996; 130p; In English
❺ Contract(s)/Grant(s): RTOP 505-68-70-04
❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
❼ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10' to 50', and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65' swept forebody serrations tended to roll together, while vortices from 40' swept serrations were more effective in generating additional lift caused by their more independent nature.
❽ Author
❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

Key

1. Document ID Number; Corporate Source
2. Title
3. Author(s) and Affiliation(s)
4. Publication Date
5. Contract/Grant Number(s)
6. Report Number(s); Availability and Price Codes
7. Abstract
8. Abstract Author
9. Subject Terms

AERONAUTICAL ENGINEERING

A Continuing Bibliography (Suppl. 418)

AUGUST 2000

01
AERONAUTICS (GENERAL)

Includes general research topics related to manned and unmanned aircraft and the problems of flight within the Earth's atmosphere. Also includes manufacturing, maintenance, and repair of aircraft.

20000072481 Illinois Univ. at Urbana-Champaign, Dept. of Aeronautical and Astronautical Engineering, Urbana, IL USA
Effects of Large-Droplet Ice Accretion on Airfoil and Wing Aerodynamics and Control *Final Report*
Bragg, M. B.; Loth, E.; Apr. 2000; 202p; In English
Report No.(s): PB2000-105936; DOT/FAA/AR-00/14; No Copyright; Avail: CASI; A03, Microfiche; A10, Hardcopy

An integrated experimental and computational investigation was conducted to determine the effect of simulated ridge ice shapes on airfoil aerodynamics. These upper-surface shapes are representative of those which may form aft of protected surfaces in super-cooled large droplet conditions. The simulated ice shapes were experimentally tested on a modified National Advisory Committee for Aeronautics (NACA) 23012 (23012m) airfoil and Natural Laminar Flow (NLF) 0414 airfoil at Reynolds numbers of 1.8 million for a range of protuberance locations, sizes, and shapes. The computational study investigated the cases encompassed by the experimental study but in addition included higher Reynolds numbers and other airfoils from the NASA Commuter Airfoil Program.
NTIS
Aerodynamics; Aircraft Control; Wing Profiles; Control Surfaces; Ice Formation; Laminar Flow Airfoils

20000073707 Naval Postgraduate School, Monterey, CA USA
How the Naval Aviation Maintenance Program (NAMP) at the Intermediate Level Can Become ISO 9000 Quality Management System Compliant
Brenneman, Stephen K.; Dec. 1999; 141p; In English
Report No.(s): AD-A374354; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This thesis examines the similarities and differences between the Naval Aviation Maintenance Program (NAMP) and International Standards Organization (ISO) 9000 quality management systems (QMS), and what changes must be done to bring the NAMP to ISO 9000 standards. The NAMP is naval aviation's overall guiding document that outlines command, administrative, and management relationships, and assigns maintenance policy and procedure responsibilities to the respective individuals for management. ISO 9000 is a series of international standards establishing requirements and guidelines for maintaining an organization's quality system, which focuses on prevention rather than detection This thesis will first examine ISO 9000 QMS aspects in relation to intermediate maintenance actions. Next, a plan for implementing the ISO 9000 QMS in naval aviation's organizational and intermediate maintenance activities is developed. Specifically, process maps are described for QM documentation, policies, and procedures under both the NAMP and ISO 9000, and then compared and contrasted. Then, a sample ISO 9000 quality manual for the Tool Control Program (TCP) on an intermediate maintenance activity, including how this manual can satisfy the 20 tenets of the ISO 9000 QMS is developed. Finally, recommended changes to NAMP QM procedures, processes, and policies are provided along with expected benefits naval aviation will receive if ISO 9000 is implemented.
DTIC
Aircraft Maintenance; Total Quality Management; Management Systems

20000073790 Department of Defense, Office of the Inspector General, Arlington, VA USA
Quality Assurance for Organic Depot Maintenance of Aircraft
Jun. 21, 1993; 50p; In English
Report No.(s): AD-A376771; IG/DOD-93-118; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The DOD quality assurance program is designed to ensure that the Military Departments' maintenance facilities provide operational systems, within specifications, that satisfy users' requirements. The program should ensure adequate quality throughout all areas of performance and provide for the prevention and ready detection of deficiencies, and for prompt and positive corrective actions. DoD budgeted about $4.1 billion for scheduled depot maintenance of aircraft for FY 1992. Increased budget pressure, as well as safety, requires that all work at military depots be performed correctly to reduce expensive rework and maintain safety and readiness.
DTIC
Aircraft Maintenance; Quality Control; Reliability Analysis

20000076641 NASA Langley Research Center, Hampton, VA USA
Aeronautical Engineering: A Continuing Bibliography with Indexes, Supplement 417
July 2000; 92p; In English
Report No.(s): NASA/SP-2000-7037/SUPPL417; NAS 1.21:7037/SUPPL417; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
This report lists reports, articles and other documents recently announced in the NASA STI Database.
Author
Bibliographies; Data Bases

20000076806 NASA Langley Research Center, Hampton, VA USA
Future Challenges and Opportunities in Aerodynamics
Kumar, Ajay, NASA Langley Research Center, USA; Hefner, Jerry N., NASA Langley Research Center, USA; [2000]; 16p; In English; 22nd; International Council of the Aeronautical Sciences, 27 Aug. - 1 Sep. 2000, Harrogate, UK; Sponsored by International Council of the Aeronautical Sciences
Report No.(s): ICAS Paper 2000-0.2; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Investments in aeronautics research and technology have declined substantially over the last decade, in part due to the perception that technologies required in aircraft design are fairly mature and readily available. This perception is being driven by the fact that aircraft configurations, particularly the transport aircraft, have evolved only incrementally, over last several decades. If however, one considers that the growth in air travel is expected to triple in the next 20 years, it becomes quickly obvious that the evolutionary development of technologies is not going to meet the increased demands for safety, environmental compatibility, capacity, and economic viability. Instead, breakthrough technologies will he required both in traditional disciplines of aerodynamics, propulsion, structures, materials, controls, and avionics as well as in the multidisciplinary integration of these technologies into the design of future aerospace vehicles concepts. The paper discusses challenges and opportunities in the field of aerodynamics over the next decade. Future technology advancements in aerodynamics will hinge on our ability, to understand, model, and control complex, three-dimensional, unsteady viscous flow across the speed range. This understanding is critical for developing innovative flow and noise control technologies and advanced design tools that will revolutionize future aerospace vehicle systems and concepts. Specifically, the paper focuses on advanced vehicle concepts, flow and noise control technologies, and advanced design and analysis tools.
Author
Aerodynamics; Three Dimensional Flow; Unsteady Flow; Viscous Flow

20000079997 NASA Langley Research Center, Hampton, VA USA
Aeronautical Engineering: A Continuing Bibliography with Indexes, Supplement 416
June 2000; 139p; In English
Report No.(s): NASA/SP-2000-7037/SUPPL416; NAS 1.21:7037/SUPPL416; No Copyright; Avail: CASI; A07, Hardcopy
This report lists reports, articles and other documents recently announced in the NASA STI Database. Aeronautics. The paper include the following: 1 Aeronautics. 2 Aerodynamics. 3 Air Transportation and Safety. 4 Aircraft Communications and Navigation. 5 Aircraft Design, Testing and Performance. 6 Avionics and Aircraft Instrumentation. 7 Aircraft Propulsion and Power. 8 Aircraft Stability and Control. 9 Research and Support Facilities. 10 Astronautics (General). 11 Chemistry and Materials (General). 12 Engineering (General). 13 Geosciences (General). 14 Life Sciences (General). 15 Mathematical and Computer Sciences (General). 16 Physics(general). 17 Social and Information Sciences (General). 18 Space Sciences (General).
CASI
Aerospace Engineering; Bibliographies; Safety; Life Sciences; Aircraft Stability; Aircraft Instruments; Aircraft Communication

02
AERODYNAMICS

Includes aerodynamics of flight vehicles, test bodies, airframe components and combinations, wings, and control surfaces. Also includes aerodynamics of rotors, stators, fans and other elements of turbomachinery.

20000070676 Risoe National Lab., Wind Energy and Atmospheric Physics Dept., Roskilde, Denmark
Wind tunnel test of the RISOe-1 airfoil
Fuglsang, P.; Antoniou, I.; Bak, C.; Madsen, H. A.; May 31, 1998; 45p; In English
Report No.(s): DE98-768891; RISO-R-999(EN); ISBN 87-550-2329-0; No Copyright; Avail: Department of Energy Information Bridge

Wind tunnel tests with approximately 2D flow were carried out for the RISOe-1 airfoil in the VELUX open jet wind tunnel. The airfoil section was mounted in a test stand equipped with end plates to retain 2D flow conditions. The stand was then inserted into the tunnel test section. The Reynolds number was 1.6 million, the chord of the airfoil model 0.6 m and the span 1.9 m. Pressure distribution measurements provided the aerodynamic load coefficients and wake rake pressure measurements provided the total drag coefficient. Wind tunnel corrections were applied for streamline curvature and down-wash. Steady inflow measurements showed that the airfoil behaved well with a well defined maximum lift coefficient of 1.3, a minimum drag of 0.0075, and a smooth stall region. Comparisons with numerical predictions from the EllipSys2D Navier-Stokes code showed good agreement among the calculated and measured lift and drag coefficients. Leading edge roughness devices were found to reduce the maximum lift coefficient by 15% to 1.1 and to increase the drag coefficient at low incidence. Dynamic inflow measurements with the airfoil in pitching motion were carried out to study the hysteresis effects on the aerodynamic coefficients. The lift coefficient hysteresis loops at high incidence had smooth shapes and did not show leading edge separation. Steady inflow measurements at high angles of attack showed that the airfoil flow was stationary and did not indicate double stall.
NTIS
Wind Tunnel Tests; Airfoil Profiles; Aerodynamic Coefficients; Pressure Measurement; Aerodynamics; Turbulent Flow

20000072473 Dayton Univ. Research Inst., Research Inst., OH USA
Development of a Scale Model Parachute Wind Sensor *Final Report*
Luers, James K.; Nov. 1998; 17p; In English
Contract(s)/Grant(s): F49620-98-1-0357; AF Proj. 2302
Report No.(s): AD-A376978; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A scale model parachute GPS wind sensor is to be designed that will follow the same trajectory as that of a full size PAD payload. This will allow the wind field to be measured where it is most needed, along the descent path of the payload. In actual operation the scale model sensor would be released shortly before the payload, the wind field calculated in real time during descent, and used in the CARP algorithm to calculate the payload release point. In order for the scale model parachute system to follow the same trajectory as the full size payload system several scaling parameters must be analyzed. A necessary condition that the airflow around scale model system. Since the flow around an object depends upon Reynolds and mach numbers, a change in these parameters could cause the airflow to change and thus the drag coefficients to change between the scale model and full size systems. The mach number will remain the same for the two systems because the systems are designed to maintain the same trajectory. The Reynolds Number however, will be necessity vary because of the difference in the dimensions of the two systems. Thus it must be established whether the variation in Reynolds number over the range that occurs between the full and scaled systems significantly changes the drag coefficient of the systems. Other parameters that may change the relative airflow between the two systems are the porosity of the parachute fabric, the mass of each systems, the length of the tether lines, and the size air passage opening in the center of each parachute. Each of these parameters is addressed in the following analyses.
DTIC
Global Positioning System; Scale Models; Wind Measurement; Wind Velocity; Real Time Operation; Parachutes; Payloads

20000072489 NASA Langley Research Center, Hampton, VA USA
Lead-Lag Control for Helicopter Vibration and Noise Reduction
Gandhi, Farhan, Pennsylvania State Univ., USA; [1995]; 22p; In English
Contract(s)/Grant(s): NAG1-2050; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

As a helicopter transitions from hover to forward flight, the main rotor blades experience an asymmetry in flow field around the azimuth, with the blade section tangential velocities increasing on the advancing side and decreasing on the retreating side. to compensate for the reduced dynamic pressure on the retreating side, the blade pitch angles over this part of the rotor disk are increased. Eventually, a high enough forward speed is attained to produce compressibility effects on the advancing side of the rotor

disk and stall on the retreating side. The onset of these two phenomena drastically increases the rotor vibratory loads and power requirements, thereby effectively establishing a limit on the maximum achievable forward speed. The alleviation of compressibility and stall (and the associated decrease in vibratory loads and power) would potentially result in an increased maximum forward speed. In the past, several methods have been examined and implemented to reduce the vibratory hub loads. Some of these methods are aimed specifically at alleviating vibration at very high flight speeds and increasing the maximum flight speed, while others focus on vibration reduction within the conventional flight envelope. Among the later are several types passive as well as active schemes. Passive schemes include a variety of vibration absorbers such as mechanical springs, pendulums, and bifilar absorbers. These mechanism are easy to design and maintain, but incur significant weight and drag penalties. Among the popular active control schemes in consideration are Higher Harmonic Control (HHC) and Individual Blade Control (IBC). HHC uses a conventional swash plate to generate a multi-cyclic pitch input to the blade. This requires actuators capable of sufficiently high power and bandwidth, increasing the cost and weight of the aircraft. IBC places actuators in the rotating reference frame, requiring the use of slip rings capable of transferring enough power to the actuators. Both schemes cause an increase in pitch link loads. Trailing Edge Flap (TEF) deployment can also used to generate unsteady aerodynamic forces and moments that counter the original vibratory loads, and thereby reduce rotor vibrations. While the vibrations absorbers, HHC, IBC, and TEF concepts discussed above attempt to reduce the vibratory loads, they do not specifically address the phenomena causing the vibrations at high advance ratios. One passive method that attempts to directly alleviate compressibility and stall, instead of reducing the ensuing vibrations, is the use of advanced tip designs. Taper, sweep, anhedral, and the manipulation of other geometric properties of the blade tips can reduce the severity of stall and compressibility effects , as well as reduce rotor power. A completely different approach to solve these problems is the tiltrotor configuration. As the forward velocity of the aircraft increases, the rotors, in this case, are tilted forward until they are perpendicular to the flow and act as propellers. This eliminates the edgewise flow encountered by conventional rotors and circumvents all the problems associated with flow asymmetry. However, the success involves a tremendous increase in cost and complexity of the aircraft. Another possible approach that has been proposed for the alleviation of vibratory loads at high forward flight speeds involves the use of controlled lead-lag motions to reduce the asymmetry in flow. A correctly phased 1/rev controlled lag motion could be introduced such that it produces a backward velocity on the advancing side and a forward velocity on the retreating side, to delay compressibility effects and stall to a higher advance ratio. Using a large enough lead-lag amplitude, the tip velocities could be reduced to levels encountered in hover. This concept was examined by two groups in the 1950's and early 1960's. In the USA, the Research Labs Division of United Aircraft developed a large lead-lag motion rotor, meant to achieve lag motion amplitudes up to 45 degrees. In order to reduce the required actuation force, the blade hinges were moved to 40% of the blade radius to increase the rotating lag frequency to approximately 1/rev. The blade hinges were redesigned to produce a flap-lag coupling so the large flapwise aerodynamic loads could be exploited to actuate the blades in the lag direction. A wind tunnel test of this rotor concept revealed actuation and blade motion scheduling problems. The project was eventually discontinued due to these problems and high blade stresses. Around the same time, at Boelkow in Germany, a similar lead-lag rotor program was conducted under the leadership of Hans Derschmidt. Here, too, the blade hinges were moved outboard to 34% radius to reduce the actuation loads. The main difference between this and the United Aircraft program was the use of a mechanical actuation scheme with maximum lead-lag motions of 400. This program was also discontinued for unclear reasons. The present study is directed toward conducting a comprehensive analytical examination to evaluate the effectiveness of controlled lead-lag motions in reducing vibratory hub loads and increasing maximum flight speed. Since both previous studies on this subject were purely experimental, only a limited data set and physical understanding of the problem was obtained. With the currently available analytical models and computational resources, the present effort is geared toward developing an in-depth physical understanding of the precise underlying mechanisms by which vibration reduction may be achieved. Additionally, in recognition of the fact that large amplitude lead-lag motions would - (i) be difficult to implement, and (ii) produce very large blade stresses; the present study examines the potential of only moderate-to-small lead-lag motions for reduction of vibratory hub loads. Using such an approach, the emphasis is not on eliminating the periodic variations in tangential velocity at the blade tip, but at best reducing these variations slightly so that compressibility and stall are delayed to slightly higher advance ratios. This study was conducted in two steps. In the first step, a hingeless helicopter rotor was modeled using rigid blades undergoing flap-lag-torsion rotations about spring restrained hinges and bearings. This model was then modified by separating the lead-lag degree of freedom into two components, a free and a prescribed motion. Using this model, a parametric study of the effect of phase and amplitude of a prescribed lead-lag motion on hub vibration was conducted. The data gathered was analyzed to obtain an understanding of the basic physics of the problem and show the capability of this method to reduce vibration and expand the flight envelope. In the second half of the study, the similar analysis was conducted using an elastic blade model to confirm the effects predicted by the simpler model.

Derived from text

Active Control; Aerodynamic Forces; Aerodynamic Loads; Aircraft Noise; Harmonic Control; Helicopters; Horizontal Flight; Vibration; Vibration Damping; Noise Reduction

20000074481 NASA Langley Research Center, Hampton, VA USA

A Sample of NASA Langley Unsteady Pressure Experiments for Computational Aerodynamics Code Evaluation

Schuster, David M., NASA Langley Research Center, USA; Scott, Robert C., NASA Langley Research Center, USA; Bartels, Robert E., NASA Langley Research Center, USA; Edwards, John W., NASA Langley Research Center, USA; Bennett, Robert M., NASA Langley Research Center, USA; [2000]; 28p; In English; Fluids 2000 Conference and Exhibit, 19-22 Jun. 2000, Denver, CO, USA

Report No.(s): AIAA Paper 2000-2602; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

As computational fluid dynamics methods mature, code development is rapidly transitioning from prediction of steady flowfields to unsteady flows. This change in emphasis offers a number of new challenges to the research community, not the least of which is obtaining detailed, accurate unsteady experimental data with which to evaluate new methods. Researchers at NASA Langley Research Center (LaRC) have been actively measuring unsteady pressure distributions for nearly 40 years. Over the last 20 years, these measurements have focused on developing high-quality datasets for use in code evaluation. This paper provides a sample of unsteady pressure measurements obtained by LaRC and available for government, university, and industry researchers to evaluate new and existing unsteady aerodynamic analysis methods. A number of cases are highlighted and discussed with attention focused on the unique character of the individual datasets and their perceived usefulness for code evaluation. Ongoing LaRC research in this area is also presented.

Author

Computational Fluid Dynamics; Unsteady Aerodynamics; Unsteady Flow; Nonlinearity; Wind Tunnel Tests; Fixed Wings; Rigid Wings; Aerodynamic Characteristics

20000076810 NASA Langley Research Center, Hampton, VA USA

Overview of Selected Measurement Techniques for Aerodynamics Testing in the NASA Langley Unitary Plan Wind Tunnel

Erickson, Gary E., NASA Langley Research Center, USA; [2000]; 54p; In English; Fluids 2000, 19-22 Jun. 2000, Denver, CO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations

Report No.(s): AIAA Paper 2000-2396; Copyright Waived; Avail: CASI; A04, Hardcopy; A01, Microfiche

An overview is given of selected measurement techniques used in the NASA Langley Research Center (LaRC) Unitary Plan Wind Tunnel (UPWT) to determine the aerodynamic characteristics of aerospace vehicles operating at supersonic speeds. A broad definition of a measurement technique is adopted in this paper and is any qualitative or quantitative experimental approach that provides information leading to the improved understanding of the supersonic aerodynamic characteristics. On surface and off-surface measurement techniques used to obtain discrete (point) and global (field) measurements and planar and global flow visualizations are described, and examples of all methods are included. The discussion is limited to recent experiences in the UPWT and is. therefore, not an exhaustive review of existing experimental techniques. The diversity and high quality of the measurement techniques and the resultant data illustrate the capabilities of a around-based experimental facility and the key role that it plays in the advancement of our understanding, prediction, and control of supersonic aerodynamics.

Author

Aerodynamic Characteristics; Aerodynamics; Aerospace Vehicles; Wind Tunnels; Supersonic Speed; Measuring Instruments

20000076815 NASA Langley Research Center, Hampton, VA USA

A Sample of NASA Langley Unsteady Pressure Experiments for Computational Aerodynamics Code Evaluation

Schuster, David M., NASA Langley Research Center, USA; Scott, Robert C., NASA Langley Research Center, USA; Bartels, Robert E., NASA Langley Research Center, USA; Edwards, John W., NASA Langley Research Center, USA; Bennett, Robert M., NASA Langley Research Center, USA; [2000]; 30p; In English; Fluids, 19-22 Jun. 2000, Denver, CO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 2000-1769; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

As computational fluid dynamics methods mature, code development is rapidly transitioning from prediction of steady flowfields to unsteady flows. This change in emphasis offers a number of new challenges to the research community, not the least of which is obtaining detailed, accurate unsteady experimental data with which to evaluate new methods. Researchers at NASA Langley Research Center (LaRC) have been actively measuring unsteady pressure distributions for nearly 40 years. Over the last 20 years, these measurements have focused on developing high-quality datasets for use in code evaluation. This paper provides a sample of unsteady pressure measurements obtained by LaRC and available. for government. university, and industry researchers to evaluate new and existing unsteady aerodynamic analysis methods. A number of cases are highlighted and

discussed with attention focused on the unique character of the individual datasets and their perceived usefulness for code evaluation. Ongoing LaRC research in this area is also presented.
Author
Computational Fluid Dynamics; Aerodynamic Characteristics; Unsteady Aerodynamics; Unsteady Flow

20000076831 NASA Langley Research Center, Hampton, VA USA
Effects of Passive Porosity on Interacting Vortex Flows At Supersonic Speeds
Erickson, Gary E., NASA Langley Research Center, USA; [2000]; 10p; In English; 9th; Flow Visualization, 2000, Edinburgh, UK; Original contains color illustrations
Report No.(s): Paper 86; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A wind tunnel experiment was conducted in the NASA Langley Research Center (LaRC) Unitary Plan Wind Tunnel (UPWT) to determine the effects of passive surface porosity on vortex flow interaction about a general research fighter configuration at supersonic speeds. Optical flow measurement and flow visualization techniques were used and included pressure-sensitive paint (PSP), schlieren, and laser vapor screen (LVS) These techniques were combined with force and moment and conventional electronically-scanned pressure (ESP) measurements to quantify and to visualize the effects of flow-through porosity applied to a wing leading-edge extension (LEX) mounted to a 65 deg cropped delta wing model.
Author
Wind Tunnel Tests; Flow Distribution; Pressure Measurement; Porosity; Vortices; Supersonic Speed

20000078370 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA
Conquering the Downwind Turn - SFTE Paper Followup
Kolwey, Herman; Jan. 2000; 29p; In English
Report No.(s): AD-A378153; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

During the month that I gave the paper, an article appeared - again in the August Plying Magazine by Peter Garrison) in which he asserted that there is no problem in turning downwind. I have watched the subsequent issues of Plying but have not seen any mail responses from the crop dusters. They have either given up or are being "filtered Out" by the aviation press. Also, the August 16 issue of Newsweek contained an article about Making Small Planes Safer (Science and Technology). This article indicates the FAA statistics attribute 1,022 general aviation accidents from 1976 to 1992 to "Spatial Disorientation". That's 64 accidents per year to this problem, one piece of which is the turning downwind problem. It also States that: "The way human beings perceive their own movement is fairly well understood". I'm not so sure.
DTIC
Wind Direction; Spatial Distribution; CH-46 Helicopter; Human Beings; Physiological Factors; Disorientation

20000080080 Rensselaer Polytechnic Inst., Dept. of Mathematical Sciences, Troy, NY USA
Theoretical Aerodynamics Research *Final Report, 1 Apr. 1997-30 Sep. 1999*
Cole, Julian D., Rensselaer Polytechnic Inst., USA; Ryzhov, Oleg S., Rensselaer Polytechnic Inst., USA; Mar. 2000; 13p; In English
Contract(s)/Grant(s): F49620-97-1-0141
Report No.(s): AD-A376319; AFRL-SR-BL-TR-00-0141; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The blunted-nose high-pressure drag is shown to exert great impact on the hypersonic flow field even in the strong interaction regime governed by viscous effects. This impact vanishes downstream where the viscous/invicid interaction becomes dominant. Optimization of conical wings in hypersonic flight substantially reduces the wave drag. A pertinent figure of merit F=CD/CL3/2 decreases by more than 4%. The concept of absolute instability in the streamwise and crossflow directions is a breakthrough in our understanding of boundary-layer properties on swept wings and gas-turbine blades where the flow field is highly three-dimensional. Many contradictions in this area were building up for decades and eventually cast doubts on the very validity of hydrodynamic stability theory. No reliable transition-prediction methods could exist on this basis. New methods to be developed in place of those used currently must incorporate the possibility of earlier transition due to upstream advancing wave packets.
DTIC
Aerodynamic Drag; Hypersonic Flight; Numerical Analysis

20000080123 NASA Dryden Flight Research Center, Edwards, CA USA
Summary of Transition Results From the F-16XL-2 Supersonic Laminar Flow Control Experiment
Marshall, Laurie A., NASA Dryden Flight Research Center, USA; August 2000; 13p; In English; Effectiveness of Flow Control

Techniques, 14-17 Aug. 2000, Denver, CO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 522-24-00
Report No.(s): AIAA Paper 2000-4418; H-2410; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A variable-porosity suction glove has been flown on the F-16XL-2 aircraft to demonstrate the feasibility of this technology for the proposed High-Speed Civil Transport. Boundary-layer transition data on the titanium glove primarily have been obtained at speeds of Mach 2.0 and altitudes of 15,240-16,764 m (50,000-55,000 ft). The objectives of this flight experiment have been to achieve 0.50-0.60 chord laminar flow on a highly swept wing at supersonic speeds and to provide data to validate codes and suction design. The most successful laminar flow results have not been obtained at the glove design point, a speed of Mach 1.9 at an altitude of 15,240 m (50,000 ft); but rather at a speed of Mach 2.0 and an altitude of 16,154 m (53,000 ft). Laminar flow has been obtained to more than 0.46 wing chord at a Reynolds number of 22.7 x 10(exp 6). A turbulence diverter has been used to initially obtain a laminar boundary layer at the attachment line. A lower-surface shock fence was required to block an inlet shock from the wing leading edge. This paper discusses research variables that directly impact the ability to obtain laminar flow and techniques to correct for these variables.
Author
Supersonic Flow; Laminar Flow; Laminar Boundary Layer; Boundary Layer Transition; Boundary Layer Control; F-16 Aircraft

20000080198 Technical Univ. of Denmark, Afd. for Fluid Mekanik, Lyngby, Denmark
Aeroacoustic modelling of low-speed flows
Wen Zhong Shen,; Noerkaer Soerensen, J.; Aug. 31, 1998; 22p; In English
Report No.(s): DE99-721499; DTU-ET-AFM-98-02; ISBN 87-7475-202-2; No Copyright; Avail: Department of Energy Information Bridge

A new numerical algorithm for acoustic noise generation is developed. The approach involves two steps comprising an incompressible flow part and inviscid acoustic part. The acoustic part can be started at any time of the incompressible computation. The formulation can be applied both for isentropic flows and non-isentropic flows. The model is validated for the cases of an isentropic pulsating sphere and non-isentropic flows past a circular cylinder and a NACA 0015 airfoil. The computations show that the generated acoustic frequencies have the form 1/m of the basic frequency of incompressible flow.
NTIS
Aeroacoustics; Incompressible Flow

03
AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; aircraft ground operations; flight safety and hazards; and aircraft accidents. Systems and hardware specific to ground operations of aircraft and to airport construction are covered in 09 Research and Support Facilities (Air). Air traffic control is covered in 04 Aircraft Communications and Navigation.

20000070841 Galaxy Scientific Corp., Egg Harbor Township, NJ USA
Denver International Airport Sensor Processing and Database *Final Report*
Dong, M.; Hayhoe, G. F.; Mar. 2000; 62p; In English
Report No.(s): PB2000-104060; DOT/FAA/AR-00/17; No Copyright; Avail: National Technical Information Service (NTIS)

Data processing and database design is described for an instrumentation system installed on runway 34R at Denver International Airport (DIA). Static (low-speed) and dynamic (high-speed) sensors are installed in the pavement. The static sensors include thermistors, resistivity probes, time domain reflectometer (TDR) moisture gages, strain gages, and joint gages sampled at a rate of once per hour. Dynamic sensors include infrared (IR) position sensors, multidepth deflectometers, strain gages, and geophones sampled at approximately 160 Hz. Peak values in the dynamic sensor records are automatically computed. The data structure for storing data from the dynamic sensors is based on single aircraft events consisting of all data collected during the passage of a single aircraft over the section of instrumented pavement.
NTIS
Airports; Data Bases; Data Processing; Sensors; Measuring Instruments

20000072582 Nebraska Univ., Aviation Inst., Omaha, NE USA
The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society, Volume 1
Own, Tae Hoon, Editor, British Columbia Univ., Canada; Bowen, Brent D., Editor, Nebraska Univ., USA; September 1997; 152p; In English; Air Transport Research, 25-27 Jun. 1997, Vancouver, Canada; Sponsored by World Conference on Transportation

Research Society; See also 20000072583 through 20000072589
Report No.(s): UNOAI-97-4-Vol-1-No-3; Copyright Waived; Avail: CASI; A08, Hardcopy; A02, Microfiche

The Aviation Institute University of Nebraska at Omaha (UNO) Monograph series has published the Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the World Conference on Transportation Research Society (WCTR) volume 1, number 3. The topics included in this document are: 1) Industrial Reform and Air Transport Development in China; 2) The Economic Effects of Airline Deregulation and the Open-Sky Policy of Korea; 3) The Economic Effects of Airline Deregulation and the Open-Sky Policy of Korea; 4) "Open Skies" in India-Is the policy succeeding? 5) The Japanese Domestic Air Fares under the Regulatory Regime: What will be expected after the revision of current charging system? 6) The Competitive Position of Airline Networks; and 7) Air Transport and Regional Economic Development in the European Union.

CASI

Air Transportation; Airline Operations; Economic Development; Policies

20000072583 City Univ. of Hong Kong, Dept. of Economics and Finance, Kowloon, Hong Kong

Industrial Reform and Air Transport Development in China

Zhang, Anming, City Univ. of Hong Kong, Hong Kong; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; September 1997; Volume 1, No. 3; 20p; In English; See also 20000072582; Copyright Waived; Avail: CASI; A03, Hardcopy; A02, Microfiche

This article describes the regulatory and enterprise reform in the Chinese airline industry and its impact on the industry's development. China's transport sector is one of the largest sectors of the Chinese economy while aviation has been the fastest growing mode. Chinese civil air transport has grown by an average of 20 percent a year since 1980 - 4.3 times the world average. The article starts with a description of China's general economic and industrial reform, followed by a description of reforms in the air transport sector. It then examines the impact of the reform on the growth and development of China's airline industry. In particular, the following aspects of the industry are discussed: air traffic growth and route development, market structure, and airline operation and competition.

Author

Air Transportation; China; Civil Aviation; Industries; Air Traffic

20000072584 Hankuk Aviation Univ., Kyunggido, Korea, Republic of

The Economic Effects of Airline Deregulation and the Open-Sky Policy of Korea

Lee, Yeong–Heok, Hankuk Aviation Univ., Korea, Republic of; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; September 1997; Volume 1, No. 3; 12p; In English; See also 20000072582; Copyright Waived; Avail: CASI; A03, Hardcopy; A02, Microfiche

From 1948 up to the year of 1969, Korean civil aviation industry had been negligible due to Korean War, political turmoil, and poor economic growth. During these years international air transport in Korea was serviced mainly by the foreign carriers of Northwest Air, Japan Air, and Cathay Pacific Air. But since 1969 when KAL (Korean Air Lines) was privatized, Korean civil aviation industry has developed very rapidly thanks to the successful growth of Korean economy and the active business of KAL. During the twenty five-year period of 1970-95, the air transport market in Korea has considerably expanded at the annual growth rate of 14.2% on the domestic routes and 21.5% on the international routes, while the annual economic growth rate of Korea was only 8.7%. Especially in the second half of 1980's, owing to the Seoul Olympic Games, the liberalization of overseas travel by the government, and the unprecedented economic boom, the air transport market has grown at the annual rate of 34.1% domestically and 18.7% internationally. The market share of Korean carriers on the international routes was above 60% in the late 1980's. After it decreased to 46.7% in 1990 due to the active frequency increase of foreign carriers, it increased significantly to 64.5% in 1995 due to the second carrier (Asiana Airlines)'s growth.

Derived from text

Civil Aviation; Economics; Korea; Policies; Aircraft Industry; Airline Operations; Air Transportation

20000072585 Sydney Univ., Inst. of Transport Studies, Australia

"Open Skies" in India: Is the Policy Succeeding?

Hooper, Paul, Sydney Univ., Australia; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; September 1997; Volume 1, No. 3; 21p; In English; See also 20000072582; Copyright Waived; Avail: CASI; A03, Hardcopy; A02, Microfiche

With a "middle class" of 200 million people in a large country where travel between the major population centres by surface transport can be arduous, India has a potentially large domestic airline market. In the post-World War III period, India nationalized its airline industry into one international carrier, Air India, and one domestic carrier, Indian Airlines, but it began to relax these

controls in 1986. Since then, a series of policy initiatives introduced what is proclaimed to be an "open skies" policy. There has been no shortage of new entrants willing to add capacity into a system where supply-side constraints are regarded as the main impediments to a boom in airline travel. However, many of these new ventures have failed within a few years and the remaining carriers, including Indian Airlines, have had to increase fares in an attempt to improve their financial performance. Far from being an "open skies" environment, airline managers continue to be subject to formal and informal government regulations and government has introduced new taxes and increased charges for aviation services. The result is an industry characterized by financial instability and low traffic growth. This paper documents the changes in the regulatory system and analyses the strategies adopted by the airlines. It is concluded that inappropriate policies are constraining development of the industry, particularly the requirement imposed by the Government for the airlines so allocate their capacity on a mix of profitable and unprofitable routes.
Author
India; Policies; Airline Operations; Industries; Civil Aviation

20000072586 British Columbia Univ., Vancouver, British Columbia Canada
The Japanese Domestic Air Fares Under the Regulatory Regime: What will be Expected After the Revision of Current Charging System?
Murakami, Hideki, British Columbia Univ., Canada; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; September 1997; Volume 1, No. 3; 17p; In English; See also 20000072582; Copyright Waived; Avail: CASI; A03, Hardcopy; A02, Microfiche

This paper statistically investigates the charging system of Japanese domestic air fares and predicts the effect of the revision of current system on the consumer's surplus. Using 222 cross section data of 1995, this paper unveiled that (a) the fares in the long haul markets were set higher regardless of the number of passengers, (b) in the outstandingly dense markets, the fares were set higher than the predicted full cost level, (c) however, in the thin and shorter haul markets, fares were a little lower. Considering the price elasticity of these three types of routes, this paper concluded that the reduction of air fares in the long haul markets (especially dense markets) to the "distance-proportional level" would lead to the substantial gain of consumer's surplus, and this would surpass the loss of consumer's surplus that might arise in shorter haul routes. There still remains substantial room for the Japanese government to improve the consumer's benefit without worsening, or maybe with improving, the status quo of the airlines.
Author
Airline Operations; Civil Aviation; Costs; Japan; Regulations; Market Research

20000072587 Civil Aviation Authority, Netherlands
The Competitive Position of Airline Networks
Veldhuis, Jan, Civil Aviation Authority, Netherlands; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; September 1997; Volume 1, No. 3; 15p; In English; See also 20000072582; Copyright Waived; Avail: CASI; A03, Hardcopy; A02, Microfiche

The contents of this paper is as follows. Firstly quality and frequency of direct as well as indirect connections are operationalized by variables indicating the 'connectivity' between markets. Secondly this concept is illustrated by introducing the so-called 'connectivity matrix' which is a simple statistical representation of the performance of any airport in the markets served from and via these airports. Before introducing this concept we have defined a study area, as well as a classification of five airport classes. The study area is Western Europe, consisting of Benelux, UK, Ireland, France, Germany, Denmark, Switzerland and Austria. The five airport classes are: 1) The 'mainports' in Western Europe: London Heathrow, Paris CDG, Frankfurt and Amsterdam; 2) The 'secondary' airports in Western Europe: Brussels, Luxemburg, London Gatwick, Manchester, Dublin, Paris Orly, Lyon, Berlin Tegel, Munich, Copenhagen, Zurich and Vienna; 3) Regional airports: all other airports in Western Europe; 4) All other airports in Europe, outside Western Europe; and 5) All airports outside Europe.
Derived from text
Airline Operations; Airports; Europe; Market Research

20000072588 New Univ. of Ulster, School of Environmental Studies, Coleraine, UK
Air Transport and Regional Economic Development in the European Union
Graham, Brian, New Univ. of Ulster, UK; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; September 1997; Volume 1, No. 3; 20p; In English; See also 20000072582; Copyright Waived; Avail: CASI; A03, Hardcopy; A02, Microfiche

The general objective of this paper, which concentrates on scheduled passenger air services, is to discuss the European Union's (EU) aviation liberalization policy within the specific context of the variable economic performances and potentials of

regions. Almost all previous discussions of the actual and potential repercussions of this policy have been dominated by the interrelated issues of competition and privatization. It is argued here, however, that the patterns of demand within the EU's air transport network are shaped by economic and social forces external to the mode, which impact differentially upon - and often constrain - the effectiveness of aviation liberalization measures. Although the precise causal relationship between infrastructural provision and economic development is less than clear, the EU and individual Member State governments have invested heavily in transport and other infrastructure as a stimulus to economic growth and to help attract inward investment to less advantaged regions. Perhaps the most obvious manifestation of this process is provided by the Trans-European Networks (TENS) being constructed to underpin the Single European Market (SEM). The Trans-European Transport Network (TETN), for example, is envisaged as a means of enhancing accessibility and integration, while harmonizing national networks into a macro-network for the EU as a whole, not least by providing missing connections (often at border locations) and the attempted elimination of bottlenecks. This initiative, which embraces rail, road, maritime and air transport modes, is also linked to other EU policies and objectives being articulated through the Regional Development and Structural Funds, which aim at socio-economic convergence and cohesion through the reduction of income inequalities and development disparities between central and peripheral regions and the promotion of an EU characterized by greater solidarity and social inclusion. Infrastructure has been a primary recipient of such investment, much of the expenditure being concentrated in the four poorest countries - Spain, Portugal, Ireland and Greece.
Derived from text

Air Transportation; Economic Development; Europe; Regions; Policies

20000072589 Pittsburgh Univ., Graduate School of Public and International Affairs, Pittsburgh, PA USA

Surviving the Single Market: Corporate Dilemmas and Strategies of European Airlines

Staniland, Martin, Pittsburgh Univ., USA; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; September 1997; Volume 1, No. 3; 34p; In English; See also 20000072582; Copyright Waived; Avail: CASI; A03, Hardcopy; A02, Microfiche

In April 1997, the liberalization of air transport within the European Union enters its final phase, in which carriers will be free to operate between all airports within the Union, and particularly on routes within Member-States. This change is potentially as radical in its implications as airline deregulation was in the US, although it mainly entails the opening of new markets to all airlines, rather than the removal of general regulatory controls on routes and pricing as was the case in the US. This paper examines, using the air transport case, the complicated interaction between deregulation (in fact, variable and asymmetrical deregulation across several markets), economic integration (represented by the establishment if the Single Market), and corporate strategy (expressed in the responses of European carriers to the challenges facing many service industries).
Derived from text

Air Transportation; Airline Operations; Airports; Market Research; Europe

20000073309 Department of Defense, Office of the Inspector General, Arlington, VA USA

AV-8B Aircraft Class A Mishaps and Engine Problems

Jul. 23, 1992; 23p; In English

Report No.(s): AD-A377530; IG/DOD-92-126; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We audited selected facets of the AV-8B Aircraft Program as requested by Congress in Conference Report 102-311, "National Defense Authorization Act for Fiscal Years 1992 and 1993," November 13, 1991. Congress requested that we conduct a comprehensive investigation into the high incidence of AV-8B mishaps classified as class A and the chronic AV-8B engine problems. Congress also requested that the General Accounting Office and the Inspector General review the management and the funding of the AV-8B Program. House and Senate Committee staff members agreed to have the General Accounting Office review the management and funding of the AV-8B program and keep the Inspector General abreast of their audit results.
DTIC

Aircraft Accidents; Congressional Reports; Harrier Aircraft

20000073726 Naval Postgraduate School, Monterey, CA USA

An Analysis of Decision Making Strategies Used by P-3 Pilots in Hazardous Situations

Watt, Christopher J.; Mar. 2000; 112p; In English

Report No.(s): AD-A376768; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Effective decision making in aeronautical environments, which often involves high elements of risk, is critical to mission success. Unfortunately, no proven methodology exists to train pilots to make successful decisions. Cockpit decision making has relied on traditional analytical models and methodologies that underestimate the role of pilot experience, expertise and judgement Naturalistic Decision Making models (NDM) contend that decision makers facing real-world decisions use experience and

judgement to make timely decisions without analyzing a multitude of alternatives. This thesis analyzes 438 P-3 aviation hazard reports (hazreps) to ascertain which cognitive strategies from either the analytical or naturalistic methodology are more appropriate for handling malfunctions situations. The author presents a hybrid model of decision making by P-3 pilots based on the results of the analysis and strategies from both methodologies. This thesis recommends that decision making training be treated as a core activity of pilots not only in flight school, but alter qualification is complete. Training pilots to become experts will improve situational awareness and reduce the number of unfavorable outcomes in hazardous situations.
DTIC
Aircraft Pilots; Decision Making; Flight Training; Flight Conditions

20000073734 National Transportation Safety Board, Washington, DC USA
Safety Recommendation
Hall, Jim; Apr. 07, 2000; 19p; In English
Report No.(s): AD-A377813; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

On June 23, 1998, about 1601 eastern daylight time, a Piper PA-31 Navajo, N711LD, and Grayhawk 06, a Navy Grumman E-2, were involved in an air traffic control (ATC) operational error, which occurred about 20 miles southwest of Bradford, Pennsylvania, Both airplanes were operating on instrument flight rules (IFR) flight plans under control of the Federal Aviation Administration's (FAA) Cleveland Air Route Traffic Control Center (ARTCC) Bradford sector. Grayhawk 06 was northbound, en route from Norfolk, Virginia, to Wellsville, New York, and N711LD was westbound, en route for Elmira, New York, to Akron, Ohio.
DTIC
Air Traffic Control; Flight Safety

20000074058 Georgia Tech Research Inst., Atlanta, GA USA
Aviation Weather Information Requirements Study, *2 Jun. - 18 Nov. 1999*
Keel, Byron M., Georgia Tech Research Inst., USA; Stancil, Charles E., Georgia Tech Research Inst., USA; Eckert, Clifford A., Georgia Tech Research Inst., USA; Brown, Susan M., Georgia Tech Research Inst., USA; Gimmestad, Gary G., Georgia Tech Research Inst., USA; Richards, Mark A., Georgia Tech Research Inst., USA; June 2000; 178p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS1-99073; RTOP 577-40-10-01
Report No.(s): NASA/CR-2000-210288; NAS 1.26:210288; GTRI-A-5990; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

The Aviation Safety Program (AvSP) has as its goal an improvement in aviation safety by a factor of 5 over the next 10 years and a factor of 10 over the next 20 years. Since weather has a big impact on aviation safety and is associated with 30% of all aviation accidents, Weather Accident Prevention (WxAP) is a major element under this program. The Aviation Weather Information (AWIN) Distribution and Presentation project is one of three projects under this element. This report contains the findings of a study conducted by the Georgia Tech Research Institute (GTRI) under the Enhanced Weather Products effort, which is a task under AWIN. The study examines current aviation weather products and there application. The study goes on to identify deficiencies in the current system and to define requirements for aviation weather products that would lead to an increase in safety. The study also provides an overview the current set of sensors applied to the collection of aviation weather information. New, modified, or fused sensor systems are identified which could be applied in improving the current set of weather products and in addressing the deficiencies defined in the report. In addition, the study addresses and recommends possible sensors for inclusion in an electronic pilot reporting (EPIREP) system.
Author
Accident Prevention; Aircraft Accidents; Flight Safety; Information Dissemination; Aircraft Safety; Weather

20000074274 General Accounting Office, Resources, Community and Economic Development Div., Washington, DC USA
Aviation Safety: Research Supports Limited Use of Personal Computer Aviation Training Devices for Pilots. Report to Congressional Requesters
July 1999; 47p; In English
Report No.(s): AD-A366143; GAO/RCED-99-143; B-280735; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

In 1998, general aviation had 1,907 accidents, with 621 fatalities. The National Transportation Safety Board estimates that 87 percent of all fatal general aviation accidents are caused by pilot error, especially when pilots who do not have appropriate instrument training fly when visibility is poor, such as during bad weather. to reduce the occurrence of general aviation accidents, the Federal Aviation Administration (FAA) has been exploring a number of means to enhance the training of general aviation

pilots. One possible enhancement is the use of new technologies for the training that occurs on the ground. For over 40 years, general aviation student pilots have used flight training devices to help them learn how to fly using an aircraft's instruments alone. These flight-training devices resemble an aircraft's cockpit and are often constructed with actual airplane instruments; they can be used by student pilots to substitute for up to 20 of the 40 hours of airplane training required by FAA to obtain an instrument rating. The instrument rating permits a pilot to fly when visibility is poor. In May 1997, FAA also approved the use of special personal computers, controls, and software called personal computer-based aviation training devices (PCATD), which can be used for up to 10 hours of instrument training. FAA's decision to allow the use of PCATDs has sparked debate. Some assert that pilots trained with these devices will be less skilled, thereby compromising aviation safety. Others argue that pilots trained with the devices are actually better trained at lower cost.
Derived from text
Aircraft Safety; Flight Safety; Flight Training; General Aviation Aircraft; Pilot Error; Pilot Training; Training Devices

20000074480 Akron Univ., Dept. of Electrical and Computer engineering, Akron, OH USA
System and Propagation Availability Analysis for NASA's Advanced Air Transportation Technologies *Final Report*
Ugweje, Okechukwu C., Akron Univ., USA; July 2000; 43p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG3-2279; No Copyright; Avail: CASI; A03, Hardcopy

This report summarizes the research on the System and Propagation Availability Analysis for NASA's project on Advanced Air Transportation Technologies (AATT). The objectives of the project were to determine the communication systems requirements and architecture, and to investigate the effect of propagation on the transmission of space information. In this report, results from the first year investigation are presented and limitations are highlighted. to study the propagation links, an understanding of the total system architecture is necessary since the links form the major component of the overall architecture. This study was conducted by way of analysis, modeling and simulation on the system communication links. The overall goals was to develop an understanding of the space communication requirements relevant to the AATT project, and then analyze the links taking into consideration system availability under adverse atmospheric weather conditions. This project began with a preliminary study of the end-to-end system architecture by modeling a representative communication system in MATLAB SIMULINK. Based on the defining concepts, the possibility of computer modeling was determined. The investigations continue with the parametric studies of the communication system architecture. These studies were also carried out with SIMULINK modeling and simulation. After a series of modifications, two end-to-end communication links were identified as the most probable models for the communication architecture. Link budget calculations were then performed in MATHCAD and MATLAB for the identified communication scenarios. A remarkable outcome of this project is the development of a graphic user interface (GUI) program for the computation of the link budget parameters in real time. Using this program, one can interactively compute the link budget requirements after supplying a few necessary parameters. It provides a framework for the eventual automation of several computations required in many experimental NASA missions. For the first year of this project, most of the stated objectives were accomplished. We were able to identify probable communication systems architectures, model and analyze several communication links, perform numerous simulation on different system models, and then develop a program for the link budget analysis. However, most of the work is still unfinished. The effect of propagation on the transmission of information in the identified communication channels has not been performed. Propagation effects cannot be studied until the system under consideration is identified and characterized. to study the propagation links, an understanding of the total communications architecture is necessary. It is important to mention that the original project was intended for two years and the results presented here are only for the first year of research. It is prudent therefore that these efforts be continued in order to obtain a complete picture of the system and propagation availability requirements.
Author
Air Transportation; Communication Networks; Computerized Simulation; Data Transmission; Simulation; Telecommunication; Radio Communication; Phase Shift Keying

20000075719 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
A Tabu Search Metaheuristic for the Air Refueling Tanker Assignment Problem
Capehart, Shay R.; Mar. 2000; 96p; In English
Report No.(s): AD-A378299; AFIT/GOR/ENS/00M-07; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

In a joint effort between Air Mobility Command (AMC) and the Air Force Institute of Technology, we present a Tanker Assignment Problem (TAP) Tool capable of providing tanker mission plans for deployment scenarios. Due to the complex nature of extracting a mission plan from the Combined Mating and Ranging Planning System (CMARPS), AMC requires a tool to provide similar results in a simpler and less time consuming manner. The tool developed allows AMC to input several receiver groups consisting of various aircraft types and numbers. Each receiver group contains a point of origin and destination, with the

option of providing one waypoint along the path. In addition, each group has a neatly to load date (RLD) and required delivery date (RDD). The user may also able to specify the locations of military tanker aircraft. The main goal of this tool is to assign the tankers to the different refueling points of the receiver groups so that all receiver groups arrive before their RDD. Secondary goals include the reuse of tankers and limiting the total flight distance for all tanker aircraft. The TAP Tool uses the heuristic technique tabu search to determine an assignment of tankers to receiver groups during a deployment.
DTIC
Air to Air Refueling; Heuristic Methods; Tanker Aircraft

20000075721 Army War Coll., Carlisle Barracks, PA USA
Develop a Better Simulation Strategy for Army Aviation
Adams, Gregory A.; Apr. 10, 2000; 51p; In English
Report No.(s): AD-A378302; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Aviation modernization programs do not assure that Army aviation forces will remain trained and ready. Modernization programs for Army helicopters throughout the 1990s did not include upgrades to the fleet of supporting training devices leaving them outdated. The U.S. Army currently operates a fleet of 36 high fidelity helicopter flight simulators at 17 sites around the world to include the continental U.S., Alaska, Hawaii, Germany and Korea. Fielding of these devices began in 1980 through 1996 and represents an investment of more than $600,000,000. Army Aviation has relied and continues to rely on these simulators for initial and sustainment training. But the computation systems, image generation and instructional system technology used in these simulators is approaching 20 years in age, and has been in great need of modernization for many years. After nearly a full decade of under-funded flight training and research, development and acquisition, Army aviation readiness is down. This represents a significantly increased operational risk to the aviation mission. A partial cause of the reduction in Army aviation readiness is outdated flight simulators.
DTIC
Aircraft Maintenance; Helicopters; Flight Simulators; Flight Training

20000075723 Naval Postgraduate School, Monterey, CA USA
Cost and Operational Effectiveness Analysis of Alternative Force Structures for Fulfillment of the USA Marine Corps Operational Support Airlift and Search and Rescue Missions
Chase, Eric T.; Mar. 2000; 132p; In English
Report No.(s): AD-A378317; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This thesis provides a preliminary cost and operational effectiveness analysis of alternative force structures for the USA Marine Corps operational support airlift and search and rescue missions. The four alternative force structures include C-12s and CH-46Es, C-35s and CH-46Es and HV-609s. Lifecycle cost analysis of the alternative force structures using Crystal Bali forecasting provides a 90% upper confidence level lifecycle cost estimate that identifies a mix of C-35s for operational support airlift and CH-46Es for search and rescue as the least expensive alternative. Operational effectiveness analysis provides a measure of overall utility for each of the four alternative force structures based on five measures of effectiveness. The measures of effectiveness examined are air travel time, total travel time, landing site requirements, range versus time on station, and payload versus range. Analytical hierarchy process rankings indicate that the HV-609 is the preferred alternative considering these measures of effectiveness. Analysis of cost versus operational effectiveness identifies the HV-609 as the most cost and operationally effective alternative for fulfilling the Marine Corps operational support airlift and search and rescue missions.
DTIC
Air Drop Operations; Air Transportation; Cost Analysis; Rescue Operations

20000075964 Army War Coll., Carlisle Barracks, PA USA
The Army's 21st Century Aviation Brigade In a Light Division
McWethy, Robert W.; Apr. 10, 2000; 35p; In English
Report No.(s): AD-A378264; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This research project expresses concern over the future of Army Aviation. There are many changes that are ongoing within the Army today. Army Aviation needs to be proactive and recommend some changes to the way it does business and the way it should look in the years to come to support the Army's future. Army Aviation is and will be supporting the Chief of Staff of the Army's (CSA) new vision for the Army. while there is much experimentation ongoing, as well as numerous proposals for the way the structure of the Army will look in the future, there is nothing substantial published on what the future of Army Aviation should be to support the CSA's vision. This project will address some of the issues and concerns of future Army Aviation operations and structure, and will propose some recommendations for the way Army Aviation should look in the not too distant future. Currently,

most of the information concerning changes to Army Aviation is sensitive in nature so the majority of this paper will contain the author's thoughts and recommendations.
DTIC
Armed Forces (USA); Military Technology; Defense Program

20000075966 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Analysis of UH-60 Blackhawk Safety Controls Using Value Focused Thinking and Monte Carlo Simulation
Gallan, Roger D., Jr; Mar. 2000; 143p; In English
Report No.(s): AD-A378277; AFIT/GOA/ENS/00M-03; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

In the past few years, Army aviation accidents have been on the rise, due largely to increases in mission frequency and complexity, and diminishing resources. The magnitude of the resulting losses (casualties, dollars, equipment) has prompted the Commanding General of the Army Safety Center to demand a complete examination of the way safety hazards and subsequent safety controls are evaluated and selected. This project integrates value focused thinking, Monte Carlo simulation, and integer programming in response to this demand by developing and using a methodology that effectively identifies and evaluates portfolios of controls. An integer program generates portfolios of controls that maximize the reduction of hazards that contribute to Army aviation accidents. Monte Carlo simulation using the bootstrap method is used to simulate the number and types of losses resulting from accidents that occur in 100,000 UH-60 flying hours. A value model has been developed to quantify the severity of these losses. The expected performance of the portfolios of controls is calculated as the anticipated decrease in severity of losses resulting from implementation of those controls.
DTIC
Aircraft Accidents; Monte Carlo Method; Helicopters; UH-60A Helicopter

20000076130 Federal Aviation Administration, Washington, DC USA
Notices to Airmen Domestic/International, April 20, 2000
Apr. 20, 2000; 238p; In English
Report No.(s): PB2000-106506; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

Contents include the following: Airway Notams; Airports; Facilities and Procedural Notams; General FDC Notams; Part 95 Revisions to Minimum En Route IFR Altitudes and Changeover Points; International Notices to Airmen; and Graphic Notices.
NTIS
Air Navigation; Airports; Runways; Navigation Aids; Flight Paths; Air Traffic Control

20000076134 Federal Aviation Administration, Washington, DC USA
Flight Services (7110.10N)
Feb. 24, 2000; 352p; In English
Report No.(s): PB2000-106267; No Copyright; Avail: CASI; A16, Hardcopy; A03, Microfiche

This order prescribes procedures and phraseology for use by air traffic personnel providing flight services. Flight service specialists are required to be familiar with the provisions of this order that pertain to their operational responsibilities and to exercise their best judgment if they encounter situations that are not covered.
NTIS
Air Traffic Controllers (Personnel); Terminology; Air Traffic Control; Procedures

20000076486 Federal Aviation Administration, Washington, DC USA
Facility Operation and Administration. 7210.3R
Feb. 24, 2000; 368p; In English
Report No.(s): PB2000-106206; No Copyright; Avail: CASI; A16, Hardcopy; A03, Microfiche

This order provides direction and guidance for the day to day operation of facilities and offices under the administrative jurisdiction of the Federal Aviation Administration's Director of Air Traffic. All concerned personnel shall familiarize themselves with the provisions pertaining to their responsibilities. When a situation arises that is not adequately covered, exercise good judgement. This order consists of the following parts: (1) Part 1 contains information generally applicable to two or more types of facilties; (2) Parts 2, 3, and 4 contain instructions unique to center, terminal, or flight service facilities; (3) Part 5 contains information applicable to Traffic Management Systems; and (4) Part 6 contains regulatory information concerning waivers, authorizations, exemptions, and flight restrictions.
NTIS
Air Traffic; Information Management; Air Traffic Control; Regulations

20000076601 National Aerospace Lab., Amsterdam Netherlands

Flight Tests to Investigate Supercooled Large Droplets in Icing Conditions

Jentink, H. W.; Jul. 1999; 17p; In English; Presented at the 11th Annual Symposium of the European Chapter of the Society of Flight Test Engineers, Delft, The Nethelands, June 21-23, 1999

Report No.(s): AD-A378180; NLR-TP-99273; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

NLR investigated the icing atmosphere for aircraft by flying with an instrumented research aircraft through clouds. Liquid water content, droplet diameter distributions and air temperature were measured. Large droplets were found in air masses with a limited extent. The flight campaign and the results from the campaign are presented. Measurements are compared with limits in regulations for aircraft and helicopter operation in icing conditions. The investigation was made in the framework of a European co-operation in the EURICE project, partially funded by the Directorate General VII for Transport of the European Commission. DTIC

Flight Tests; Ice Formation; Aircraft Safety; Research Aircraft

20000080022 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA

Rotary Wing Aircraft Water Impact Test and Analyses Correlation

Wittlin, Gil; Schultz, Mike; Smith, Michael; Jan. 2000; 16p; In English

Report No.(s): AD-A378036; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

NAWCAD Patuxent River in cooperation with the Federal Aviation Administration is sponsoring a Small Business Innovation Research (SBIR) Phase II program to investigate water impact dynamics relevant to DoD, DOT, and industry. One of the primary objectives of the program is to develop analytical tools that can be used to facilitate the process of showing compliance with current civil and military ditching requirements with a decreasing dependence on expensive scale model ditching tests. This paper describes an effort that focuses on the application of a crash modeling and simulation approach utilizing both a nonlinear finite-element code (MSC/DYTRAN(registered)) and a hybrid impact code (DRI/KRASH) to demonstrate the potential for airframe water impact analysis in the development of crash design criteria and concepts. The test recorded pressures, accelerations, and damage from a fully instrumented UH-1H helicopter 26-ft/sec. vertical impact into water are presented. Pretest analyses using DRI(KRASH and MSC/DYTRAN(registered)) are provided and compared to the test measured results. Post-test modeling considerations and results are discussed and presented. Time histories of acceleration and pressure responses are included. A fuselage underside damage assessment is provided. A summary of overall averages and discrete point-by-point comparisons are included, as well as average pressures and floor pulses. The results presented are a partial fulfillment of the SBIR goals. Additional tasks on the SBIR are noted.
DTIC

Damage Assessment; Impact Tests; Crashworthiness; Simulation; Design Analysis; UH-1 Helicopter

20000080035 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Using RSM, DOE, and Linear Regression to Develop a Metamodel to Predict Cargo Delivery of a Time Phase Force Deployment Document

Browne, Ken S.; Mar. 2000; 82p; In English

Report No.(s): AD-A378137; AFIT/GOA/ENS/00M-01; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Air Mobility Command (AMC) uses the Airlift Flow Model as their primary tool to estimate the amount of cargo delivered in a Time Phase Force Deployment Document (TPFDD). The primary objective of this research was an exploratory investigation in the development of a metamodel to predict the amount of cargo delivered from a TPFDD by AMC into a theater. In creating a valid metamodel the analyst would be able to quickly provide the decision-maker with accurate insights should input parameters change. This would save valuable time and replace the need to physically change the input parameters and re-run the simulation. Techniques that were applicable to create this metamodel include DOE, RSM, and Linear Regression. Using the techniques outlined in this research a second metamodel was constructed using a separate set of data to validate the procedure. In both cases, the results substantiated good predictive capability between the simulation and the metamodel. The analysis procedures outlined in this effort allows the researcher to identify the salient factors to the metamodel in a timely, efficient manner.
DTIC

Regression Analysis; Mathematical Models; Deployment; Delivery; Air Cargo; Computerized Simulation

20000080101 North Carolina State Univ., Dept. of Marine, Earth and Atmospheric Sciences, Raleigh, NC USA

An Estimation of Turbulent Kinetic Energy and Energy Dissipation Rate Based on Atmospheric Boundary Layer Similarity Theory

Han, Jongil, North Carolina State Univ., USA; Arya, S. Pal, North Carolina State Univ., USA; Shaohua, Shen, North Carolina

State Univ., USA; Lin, Yuh–Lang, North Carolina State Univ., USA; June 2000; 34p; In English
Contract(s)/Grant(s): NCC1-188; NAS1-18925; RTOP 576-02-11-11
Report No.(s): NASA/CR-2000-210298; NAS 1.26:210298; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Algorithms are developed to extract atmospheric boundary layer profiles for turbulence kinetic energy (TKE) and energy dissipation rate (EDR), with data from a meteorological tower as input. The profiles are based on similarity theory and scalings for the atmospheric boundary layer. The calculated profiles of EDR and TKE are required to match the observed values at 5 and 40 m. The algorithms are coded for operational use and yield plausible profiles over the diurnal variation of the atmospheric boundary layer.

Author

Turbulence; Kinetic Energy; Energy Dissipation; Turbulent Boundary Layer; Atmospheric Boundary Layer

04
AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes all modes of communication with and between aircraft; air navigation systems (satellite and ground based); and air traffic control.

20000072443 NASA Goddard Space Flight Center, Greenbelt, MD USA

The DORIS Data Center at the CDDIS

Noll, Carey E., NASA Goddard Space Flight Center, USA; Dube, Maurice, Raytheon Co., USA; [2000]; 5p; In English; DORIS Days 2000 Symposium, 2-3 May 2000, Toulouse, France; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The DORIS system (Doppler Orbitography and Radio positioning Integrated by Satellite) was designed and developed by CNES, the National Geographic Institute, IGN (Institut G6ographique National), and the Space Geodesy Research Group, GRGS (Groupe de Recherches de Geodesie Spatiale - CNES/CNRS/Universite Paul Sabatier) to meet new needs for the precise determination of satellite positions on their orbits and for precise positioning of terrestrial beacons. This system has been carried since 1990 on the French SPOT 2 satellite, since 1992 on the French/American satellite TOPEX/POSEIDON, and since 1998 on the French SPOT 4 satellite. It will be part of the JASON (CNES/NASA) and ENVISAT (ESA) altimetric missions and also the SPOT follow-on Earth observation missions. DORIS is a radio-electrical system which takes Doppler measurements between a satellite in low orbit and a permanent global network for the purpose, on the one hand, of determining the satellite's position in orbit, and on the other hand, of locating ground beacons with a high degree of precision.

Author

Earth Observations (From Space); French Satellites; Positioning

20000074068 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Deployment of Autonomous GPS Stations in Marie Byrd Land, Antarctica

Donnellan, Andrea, Jet Propulsion Lab., California Inst. of Tech., USA; Luyendyk, Bruce, California Univ., USA; Rebold, Thomas, Jet Propulsion Lab., California Inst. of Tech., USA; Awaya, Henry, Jet Propulsion Lab., California Inst. of Tech., USA; Nesbit, William, Antarctic Support Associates, USA; Dace, Gregory, Acumen Instruments Corp., USA; [1999]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

During the 1998-1999 Antarctic field season, we installed three autonomous GPS stations in Marie Byrd Land, West Antarctica to measure glacio-isostatic rebound and rates of spreading across the West Antarctic Rift System. The systems collect data throughout the entire year and therefore must function during the warm, relatively mild summer, and cold, harsh winters. They are powered by gel cell batteries that are charged by wind and solar power. The system includes dual data logging capability. We log data at 5 minute intervals within the receiver and at 30 second intervals to a serial data logger. We do not require 365 days of continuous data for well determined crustal velocities, but rather long periods (greater than 24 hours) of continuous data distributed throughout the year. Therefore, for simplicity, we designed the system to accept occasional data interruptions. The batteries, in addition to supplying power, act as a thermal capacitive heat storage device to help regulate the temperatures within the system. This storage system absorbs the majority of the 10-15 watts of power from the receiver and 5 watts from the data logger which helps to maintain temperature for long periods of time. Power is switched off when the temperature within the system enclosure reaches 50'C and is reconnected at 20 C. If battery voltage drops too low the batteries will freeze. Therefore, we cut the power off when the batteries drop to a low voltage of 12.45V. Power is restored at 13.2V. The temperature and power hysteresis allows for a minimum of several days of data to be collected before system shutdowns. A check of all three stations in late January

1999 indicated that the thermal and power control systems are performing as expected. We plan to implement satellite telemetry to the systems during the 2000-2001 season following a year of development.
Author
Antarctic Regions; Autonomy; Global Positioning System; Solar Generators

20000074699 Onsala Space Observatory, Sweden
A New GPS-VLBI Tie at the Onsala Space Observatory
Bergstrand, Sten, Onsala Space Observatory, Sweden; Haas, Ruediger, Onsala Space Observatory, Sweden; Johansson, Jan, Onsala Space Observatory, Sweden; International VLBI Service for Geodesy and Astrometry: 2000 General Meeting Proceedings; May 2000, pp. 128-132; In English; See also 20000074683
Contract(s)/Grant(s): FMRX-CT96-0071; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

Onsala is a collocated reference site for International VLBI Service for Geodesy and Astrometry (IVS) as well as International GPS Service (IGS). In order to establish a new type of tie between the two reference frames, we have installed two Dorne Margolin GPS choke ring antennas on the 20 m VLBI telescope that is situated inside a radome. One of the antennas is permanently mounted on the subreflector support structure, the other one is intermittently attached close to the vertex of the parabola with a rigid support. Since mid 1999, repeated measurements have been performed pointing the VLBI telescope to the zenith position. In addition we made experiments with a moving 20 m dish, but without success. to obtain accurate positions of the two antennas, we found that measurements inside the radome are feasible without further multipath suppression than that already provided by the choke rings and that a data set consisting of 24 hour uninterrupted measurements was necessary.
Author
Global Positioning System; Very Long Base Interferometry; Astronomical Observatories; Radio Telescopes; Parabolic Antennas

20000074727 Norwegian Defence Research Establishment, Norway
Combination of VLBI, GPS and SLR Data at the Observation Level: A Status Report
Andersen, Per Helge, Norwegian Defence Research Establishment, Norway; International VLBI Service for Geodesy and Astrometry: 2000 General Meeting Proceedings; May 2000, pp. 288; In English; See also 20000074683; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

A significant number of VLBI and SLR stations are equipped with GPS receivers. A few true fundamental stations with all three techniques even exist. Each technique has its strength and weakness with respect to the determination of geodetic parameters and together they complement each other in a way that should be fully taken advantage of in the data analysis. The simultaneous analysis of different data types at the observation level, due consideration of the physical interrelations, and presentation of results in a common reference system, are the main ideas behind the development of the GEOSAT software. A new and improved version of the software has been implemented with automatic generation of 1) observation residuals and observation partial derivatives for VLBI, GPS and SLR, consistent at the 0.1 ppb level, and 2) a simultaneous arc-by-arc UD-filtering at the observation level. A very advanced multi-level (presently four parameter levels including stochastic parameter representations at each level) SRIF arc combination software for long-term solutions has been developed and validated. The main elements of the processing scheme will be presented. The first results with a simultaneous analysis of different space geodetic data types (VLBI, GPS, and SLR) at the observation level were presented at the IERS-98 symposium in Potsdam and at GPS99 in Tsukuba. The analysis has recently been extended with significantly more observations. Results (Earth orientation parameters, geocenter, radio source coordinates, station coordinates, ...) from the new analysis will be presented. It is demonstrated that UT1 and nutation parameters can be determined also for days where VLBI data is unavailable.
Author
Geodesy; Global Positioning System; Very Long Base Interferometry; Radio Receivers; Computer Programs; Data Processing

20000075266 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Breadth of Scientific Activities and Network Station Specifications in the International GPS Service (IGS)
Moore, A. W., Jet Propulsion Lab., California Inst. of Tech., USA; Neilan, R. E., Jet Propulsion Lab., California Inst. of Tech., USA; Springer, T. A., Bern Univ., Switzerland; Reigber, Ch., GeoForschungsZentrum, Germany; [2000]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

A strong multipurpose aspect of the International GPS Service (IGS) is revealed by a glance at the titles of current projects and working groups within the IGS: IGS/BIPM Time Transfer Project; Ionosphere Working Group; Troposphere Working Group; International GLONASS Experiment; Working Group on Low-Earth Orbiter Missions; and Tide Gauges, CGPS, and the IGS. The IGS network infrastructure, in large part originally commissioned for geodynamical investigations, has proved to be a valuable asset in developing application-oriented subnetworks whose requirements overlap the characteristics of existing IGS

stations and future station upgrades. Issues encountered thus far in the development of multipurpose or multitechnique IGS projects as well as future possibilities will be reviewed.
Author
Global Positioning System; Multidisciplinary Research

20000075423 Norwegian Defence Research Establishment, Kjeller, Norway
Two Approaches for Automatic Recognition of PRF-Patterns ***To Metoder for Automatisk Gjenkjenning av PRF-Monstre***
Pedersen, Stein Inge, Norwegian Defence Research Establishment, Norway; Malnes, Eirik, Norwegian Defence Research Establishment, Norway; Jun. 07, 2000; 56p; In Norwegian; Original contains color illustrations
Contract(s)/Grant(s): Proj. FFIE/728/113
Report No.(s): FFI/RAPPORT-2000-02480; ISBN 82-464-0420-2; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report is part of the KONTUR videreforing project which focuses on the development of an ESM-system for air traffic surveillance. From signals received by the ESM-sensor, one would wish to be able to identify which type of radars the signals are emitted from. Modern MPRF-radars vary between a set of different PRFs on a pulstrain to pulstrain basis. The pulstrains which are emitted with different PRFs, comprise a pattern which is characteristic for the specific type of radar, and by extracting and recognising such patterns, classification of radars can be performed. In this report, we propose a strategy for performing automatic recognition of PRF-patterns. We start by examining how the continuous flow of radar signals in the sensor should be divided into manageable parts, how multiples of a pulstrain can be removed and how abrupted emissions can be connected. In the process of extracting the patterns, we examine two different ways of performing this task. The first approach is based on examining the transitions from a PRF-state to another and choosing the most frequently appearing transition as being the pattern between the two states. This is done for all states, and the complete pattern is thus deduced. This approach has problems coping with patterns which include repetitions of PRF-states and overlapping patterns which all include the same PRF-states. As a solution to this, a second approach is examined which will be able to overcome such problems. The approach consist of two layers, where the bottom layer produces different candidate patterns, from which the most appealing pattern is chosen in the logic layer. Finally, we briefly discuss how a pattern database should be designed and how this can be used to eliminate familiar patterns from the data prior to the pattern analysis, and also how emission tracking may be performed.
Author
Radar Detection; Surveillance Radar; Pulse Repetition Rate; Signal Detection; Identifying

20000075651 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Highlights of Recent Developments in the International GPS Service and Perspectives for Future Directions
Neilan, R., Jet Propulsion Lab., California Inst. of Tech., USA; Reigber, C., GeoForschungsZentrum, Germany; Springer, T., Bern Univ., Switzerland; Beutler, G., Bern Univ., Switzerland; Kouba, J., Natural Resources Canada, Canada; [1999]; 1p; In English, Birmingham, UK; Sponsored by International Council of Scientific Unions; No Copyright; Avail: Issuing Activity; Abstract Only

In December 1998, the IGS Governing Board officially changed the name of this IAG service from 'International GPS Service for Geodynamics to simply the 'International GPS Service'. This change of name reflects the fact that today the IGS supports numerous scientific projects outside the traditional geodetic and geodynamic disciplines. A number of IGS projects and working groups have been established, each concentrating on a particular science application, such as the ionosphere, atmosphere, reference frame, precise time transfer, etc. These activities are enabled and simulated by the IGS and directly contribute to the continuing development of the service. The IGS is currently poised to respond to evolving user requirements that focus on timeliness and reliability of data and products, particularly in support of a slate of Low Earth Orbiter missions over the next decade. Perspectives on the future of the IGS will be developed based on current directions as well as anticipated external influences, such as GPS satellite modernization, GLONASS, availability of global communications, and plans for the European GALILEO (Global Navigation Satellite System - GNSS). We will address development of user friendly interfaces and IGS product tutorials.
Author
Global Positioning System; Geodynamics; Galileo Spacecraft; Coordinates

20000076599 General Accounting Office, Resources, Community and Economic Development Div., Washington, DC USA
National Airspace System Persistent Problems in FAA's New Navigation System Highlight Need for Periodic Reevaluation
Jun. 2000; 40p; In English; Report to the Chairman, Subcommittee on Transportation, Committee on Appropriations, U.S. Senate
Report No.(s): AD-A378233; GAO/RCED/AIMD-OO-130; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Currently, the Federal Aviation Administration (FAA) relies principally on a ground-bases navigation system that uses various types of equipment to assist pilots in navigating their assigned route and to provide them with guidance for landing their aircraft safely in different types of weather. However, this ground-based navigation system is aging and limited in its geographic

coverage. FAA is planning a transition from its ground-based navigating system to a satellite-based system using radio signals generated by Global Positioning System (GPS) to provide greater geographic coverage, among other things. The Department of Defense developed GPS to support military missions and functions. However, the system is now a dual-use system, and other users --- pilots, truckers, and boaters -- rely on signals from the GPS satellites to calculate their time, speed, and position anywhere on or above the earths surface. As part of its efforts to maintain GPS and make it more useful for civilians, in May 2000, Defense ceased its practice of intentionally degrading the accuracy of the GPS signal available for civil use. Furthermore, Defense plans to begin gradually replacing the existing satellites with new ones that will also improve system performance.
DTIC
Global Positioning System; Navigation Satellites; Flight Safety; National Airspace System; Navigation

20000080270 NASA Goddard Space Flight Center, Greenbelt, MD USA
A LEO Satellite Navigation Algorithm Based on GPS and Magnetometer Data
Deutschmann, Julie, NASA Goddard Space Flight Center, USA; Bar–Itzhack, Itzhack Y., Technion - Israel Inst. of Tech., Israel; Harman, Rick, NASA Goddard Space Flight Center, USA; [2000]; 2p; In English; 15th; Space Flight Dynamics, 26-30 Jun. 2000, Biarritz, France; No Copyright; Avail: Issuing Activity; Abstract Only

The Global Position System (GPS) has become a standard method for low cost onboard satellite orbit determination. The use of GPS as an attitude and rate sensor has also been developed in the recent past. Additionally, focus has been given to attitude and orbit estimation using the magnetometer, a low cost, reliable sensor. Combining measurements from both GPS and a magnetometer can provide a robust navigation system which takes advantage of the estimation qualities of both measurements. Ultimately a low cost, accurate navigation system can result, potentially eliminating the need for more costly sensors, including gyroscopes. This work presents the development and preliminary testing of a unified navigation algorithm which produces estimates of attitude, angular rate, position, and velocity for a low earth orbit (LEO) spacecraft. The system relies on GPS phase, range, and range rate data as well as magnetometer data. The algorithm used is an extended Kalman filter (EKF) developed to provide LEO attitude, orbit, and rate estimates using magnetometer and sun sensor data. Incorporating sun sensor data into the EKF improved the attitude and rate estimates. For many LEO spacecraft the sun data is available during only a portion of the orbit. However, GPS data is available continuously throughout the orbit. GPS can produce accurate orbit estimates and combining GPS and magnetometer data improves the attitude and rate estimates. The magnetometer based EKF can converge from large initial errors in position, velocity, and 3 attitude . Combining the magnetometer and GPS data into a single EKF will provide a more robust and accurate system. The EKF is based on an existing EKF. The GPS measurement models for phase, range, and range rate are incorporated into the existing structure of the filter. The original EKF produced the orbit estimates in terms of Keplerian elements. Due to the nature of the GPS measurements and ease of computation, the orbit estimates are converted to the Cartesian position and velocity. The measurement model for the magnetometer is adjusted for this change in the state and the measurements. Preliminary test results based on simulated GPS and magnetometer data are included.
Author
Algorithms; Global Positioning System; Kalman Filters; Low Earth Orbits; Magnetometers; Satellite Orientation; Satellite Navigation Systems

05
AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance, and evaluation, and aircraft and flight simulation technology.

20000070743 Stanford Univ., Edward L. Ginzton Lab. of Physics, Stanford, CA USA
Aging Aircraft NDE With Micromachined Ultrasonic Air Transducers *Final Report, 1 Mar.-30 Sep. 1999*
Khuri–Yakub, Butrus T.; Apr. 2000; 9p; In English
Contract(s)/Grant(s): F49620-99-1-0137; AF Proj. 2306
Report No.(s): AD-A377646; AFRL-SR-BL-TR-00-0186; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Due to the large impedance mismatch between common piezoelectric materials and air, conventional piezoelectric transducers are not very efficient sources of ultrasound in air. Therefore, piezoelectric nondestructive evaluation (NDE) systems must use a coupling fluid to improve the power transfer to the sample. Use of a coupling fluid or immersion of the sample complicates inspection, and in some cases is undesirable. Air-coupled ultrasonic systems are preferable as long as efficient transducers are available for transferring ultrasound into air. This report discusses some capacitive micro machined ultrasonic transducers (CMUTs) that have more than 100 dB 113 dynamic range in a bistatic transmission system. These transducers consist

of thousands of 1 (m-thick silicon-nitride membranes, resonating at 2-3 MHz electrically connected in parallel. Equivalent circuit modeling of the transducers provides insight into the design of the devices and enables accurate predictions of CMUTs' behavior in NDE systems. Finally, the report concludes with some discussion of current research in developing efficient, wide-band CMUTs.
DTIC
Nondestructive Tests; Ultrasonics; Ultrasonic Wave Transducers; Piezoelectric Transducers

20000072429 Naval Undersea Warfare Center, Newport, RI USA
Unmanned Vehicle Initiatives to Expand the USW Battlespace
Ricci, Vittorio; Lisieqicz, John S.; Mar. 21, 2000; 12p; In English
Report No.(s): AD-A377668; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper discusses the current development challenges and unmanned vehicle technology demonstrations for two on-going unmanned vehicle initiatives for expanding the battlespace for USW: MANTA unmanned undersea vehicles (UUV's) and SPARTAN unmanned surface vehicles (USV's). Modular payload designs common to both UUV and USV efforts enable rapid reconfiguration for numerous missions including ASW, ISR, SSTD, counter-SOF, MIW, cruise missile defense, etc. while the SPARTAN USV is envisioned as a high-speed, long endurance platform performing operations after hostilities break out, the MANTA UUV capitalizes on endurance in clandestine operations performed during the pre-hostilities phase. Operation synergy is gained with acoustic communications (ACOMMS) which would permit subsurface forces to remain clandestine for the duration of the mission. The modular MANTA technology test bed offers reduced operating cost, supports large size payloads, and provides extended operation using low cost energy sources. Both MANTA and SPARTAN will be primary asymmetric force levelers enabling the battle force commander to match inexpensive threat capability with an appropriate response. Inherent netcentricity increases USW effectiveness by providing expanded sensor coverage in areas where other assets are difficult to deploy or where risk to manned platforms is unacceptable.
DTIC
Remotely Piloted Vehicles; Underwater Vehicles; Surface Vehicles

20000072475 General Accounting Office, National Security and International Affairs Div., Washington, DC USA
Unmanned Aerial Vehicles: Progress of the Global Hawk Advanced Concept Technology Demonstration
Ward, Charles; Strittmatter, Richard; McGuire, Michael; Apr. 2000; 15p; In English; Report to Congressional Committees.
Report No.(s): AD-A376992; GAO/NSIAD-00-78; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Department of Defense (DOD) has built five prototype Global Hawk reconnaissance aircraft for use in a High Altitude Endurance Unmanned Aerial Vehicle Advanced Concept Technology Demonstration. The Advanced Concept Technology Demonstration's purpose is to determine through design and construction of Global Hawk prototypes, and a subsequent assessment of their utility in military user demonstrations, if the concept is effective as an Air Force reconnaissance aircraft before DOD decides whether to acquire a production version of it. Reconnaissance aircraft such as Global Hawk are used to obtain information about the activities and resources of enemy forces. If DOD decides to acquire Global Hawk, the production version is expected to provide the Air Force with the ability to fly for 40 continuous hours and conduct reconnaissance for up to 24 hours at a radius of 3,000 nautical miles. In 1994, when the Advanced Concept Technology Demonstration was initiated, DOD established a $10-million average unit flyaway price goal in fiscal year 1994 dollars for air vehicles numbered 11 through 20.2 The unit flyaway price covers the cost of the vehicle, its reconnaissance sensors, and the contractor's fee. Unit flyaway price excludes costs for systems engineering and program management, system test and evaluation and non-recurring tooling, engineering and manufacturing development, and non-flying support equipment such as the ground control station.
DTIC
Pilotless Aircraft; Aerial Reconnaissance; Reconnaissance Aircraft; Systems Engineering; Manufacturing

20000072476 Department of Defense, Office of the Inspector General, Arlington, VA USA
Environmental Consequence Analyses for the V-22 Osprey Program
Reed, Donald E.; Rau, Russell A.; Hopkins, Wanda A.; Snider, Jack D.; Lowe, Alvin B.; Mar. 29, 1993; 29p; In English
Report No.(s): AD-A376997; IG/DOD-93-077; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The audit objectives were to evaluate the effectiveness of DoD environmental consequence analyses of major Defense acquisition programs and to assess compliance with provisions of the National Environmental Policy Act of 1969 and internal

controls related to the objectives. The V-22 Osprey was one program in the audit of the Effectiveness of DoD Environmental Consequence Analyses of Major Defense Acquisition Programs.
DTIC
Helicopters; V-22 Aircraft; Environment Management

20000072478 Federal Aviation Administration, Office of Aviation Research, Washington, DC USA
Flammability of Aircraft Insulation Blankets Subjected to Electrical Arc Ignition Sources
Cahill, P.; Apr. 2000; 20p; In English
Report No.(s): PB2000-105920; DOT/FAA/AR-TN00/20; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In the fall of 1998, the Federal Aviation Administration (FAA) initiated a program of intense testing, i.e., full-scale testing, intermediate testing, bench-scale testing, and electrical ignition testing on thermal acoustical insulation. This work was prompted by several factors related to current fire test requirements, including the crash of the Swissair MD-11 off the coast of Canada, and the failure of an industry fire test standard called the cotton swab test to characterize the flammability characteristics of a certain foam and fiberglass cover material. The thermal acoustical insulation films tested in this program were polyimide, metallized and nonmetallized polyester polyimide, metallized and nonmetallized polyester poly (ethylene terethalate) (PET) and metallized poly (vinyl fluoride) (PVF). The test blankets were subjected to 115- and 208-volt electrical arcing test. This same testing was performed on these blankets with a corrosion inhibiting compound (CIC) sprayed on them.
NTIS
Electric Arcs; Flammability; Glass Fibers; Thermal Insulation; Aircraft Industry; Full Scale Tests

20000072501 Naval Postgraduate School, Monterey, CA USA
AH-64 Apache Cost Reduction
Short, Daniel R.; Mar. 2000; 125p; In English
Report No.(s): AD-A377413; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The Total Ownership Cost Reduction (TOCR) Program was implemented to assist the Program Manager (PM) in upgrading components with significant life-cycle costs. Neither a formal database tracking system for corrosion nor a funded program for updating corrosion-susceptible parts exists. In 1996, at Hunter Army Airfield, Georgia, replacement of corroded gearboxes on the AH-64A Apache Helicopter accounted for $1.12M, yet went unnoticed due to the lack of a comprehensive database. The Apache PM experiences difficulty in taking full advantage of the TOCR program because of application and funding uncertainties. Corrosion of the Apache's driveline components merits overhaul-procedure modifications under the TOCR program. However, the lack of database tracking and inadequate TOCR program funding discourage PM use. This thesis researches component database tracking and TOCR funding to facilitate the PMs reduction of the Apache's life-cycle costs.
DTIC
AH-64 Helicopter; Cost Reduction; Life Cycle Costs; Aircraft Maintenance

20000073286 Department of Defense, Office of the Inspector General, Arlington, VA USA
Acquisition of Unmanned Aerial Vehicles
Reed, Donald E.; Meling, John E.; Wyte, David M.; Stockton, Donald N.; May 27, 1993; 63p; In English
Report No.(s): AD-A376754; IG/DOD-93-102; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The audit objective was to evaluate the overall management of the UAV acquisition programs included in the calendar year 1991 DoD UAV Master Plan. Specifically, the audit determined whether the Short Range, Close Range, and Medium Range UAV programs were being cost-effectively developed and readied for procurement. We also reviewed associated internal controls.
DTIC
Pilotless Aircraft; Target Acquisition; Aircraft Detection

20000073320 Department of Defense, Office of the Inspector General, Arlington, VA USA
Navy's Aircraft Structural Life Surveillance Program Data Recorders
Nov. 12, 1992; 12p; In English
Report No.(s): AD-A377461; IG/DOD-93-022; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We are providing this final report for your information and use. This audit was performed in response to a DoD Inspector General hotline allegation that the Navy's planned $188 million procurement of structural data recorders under the Navy's Aircraft Structural Life Surveillance Program duplicated existing Navy recorder systems. The recorder monitors the structural stress that

an aircraft experiences during operation. Our objective was to evaluate the validity of this allegation. We also evaluated the effectiveness of applicable internal controls.
DTIC
Aircraft Structures; Life (Durability); Structural Analysis; Recorders

20000074277 Army Research Lab., Survivability/Lethality Analysis Directorate, Aberdeen Proving Ground, MD USA
Analytical Calculations of Helicopter Torque Coefficient (C(sub Q)) and Thrust Coefficient (C(sub T)) Values for the Helicopter Performance (HELPE) Model *Final Report*
Kim, Ki C., Army Research Lab., USA; June 1999; 30p; In English
Contract(s)/Grant(s): DA Proj. 1L1-62618-AH-80
Report No.(s): AD-A365512; ARL-TR-1986; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

A computer program for calculating helicopter torque coefficients (CQ) and thrust coefficients (CT) as a function of a vehicle's forward speed has been developed in conjunction with the helicopter performance assessment project. The model is based on the energy principle, in which helicopter power is broken into three components: induced power, profile power, and parasite power. This report documents the b.)sic mathematical model used in the code, along with the numerical solution scheme used in implementing the model. Results are calculated for the UH-60A Black Hawk helicopter for hover and different forward speed settings and correlated with existing flight test data. The effects of different disk loading on helicopter power requirements are also investigated. The present model agrees reasonably well with the flight test data, providing the author with a certain confidence in the helicopter aerodynamic model developed in the present study.
Author
Helicopter Performance; Mathematical Models; Thrust; Torque; UH-60A Helicopter

20000075539 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Improving UAV Handling Qualities Using Time Delay Compensation
Thurling, Andrew J.; Mar. 2000; 297p; In English
Report No.(s): AD-A378376; AFIT/GAB/ENY/00M-01; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

This research investigated control loop time delay and its effect on UAV handling qualities. Compensation techniques to improve handling qualities in the presence of varying amounts of time delay were developed and analyzed. One technique was selected and successfully flight-tested on a UAV. Flight-testing occurred at a constant flight condition with varying levels of additional time delay introduced into the control loop. Research pilots performed a pitch tracking task and gave Cooper-Harper ratings and comments. Tracking errors were used as a quantitative measure of Pilot/Display/UAV system performance. Predictive pitch compensation was found to significantly reduce pilot workload and improve Cooper-Harper ratings. Using the predictive display doubled the amount of system time delay that research pilots could tolerate while tracking the task bars. Overall system tracking performance, however, was not improved. Parameter variations of +/- 20% in the aerodynamic model used to generate the predictive display produced statistically significant, although not operationally significant, changes in both pilot opinion and performance. Analysis of flight test data and follow-on simulations resulted in predictor improvements that increased predictor accuracy to the point of restoring system tracking performance to equal that of the system with no additional time delay.
DTIC
Computer Programs; Data Processing; Data Simulation; Flight Conditions; Flight Tests; Pilot Performance

20000075547 General Accounting Office, National Security and International Affairs Div., Washington, DC USA
Defense Acquisitions: Use of Cost Reduction Plans in Estimating F-22 Total Production Costs
Jun. 15, 2000; 14p; In English
Report No.(s): AD-A378432; GAO/T-NSIAD-00-200; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

I am pleased to be here today to discuss our ongoing work on the impact that production cost reduction plans are projected to have on the Air Force's F-22 Raptor Program. The F-22 Raptor is an air superiority aircraft being developed to replace F-15 fighter aircraft. Lockheed Martin Corporation and Pratt & Whitney Corporation are the contractors for the airframe and engine, respectively. Development, which started in 1991, is scheduled to be completed in August 2003. The Air Force plans to enter low-rate initial production in December 2000. Appendix I lists products we have issued that relate to the F-22 program. Projections of higher production costs have been a source of concern for several years. In 1996, because of potential cost increases, the Air Force established a team--known as the Joint Estimating Team--to review the total estimated cost of the F-22 program. The team concluded that the cost of production could grow substantially from the amounts planned, but that cost reduction initiatives could be implemented to offset that cost growth. The Office of the Undersecretary of Defense for Acquisition, Technology, and Logistics generally adopted the team's recommendations to change certain aspects of the program, as well as a plan to define and implement

cost reduction initiatives. F-22 production costs were also discussed in the National Defense Authorization Act for Fiscal Year 1998 (P.L. 105-85, Nov. 18,1997). That act limited the total cost of F-22 production but did not specify the total number of aircraft to be procured. The most recent production costs estimates were completed by the Air Force and the Office of the Secretary of Defense in 1999. Both of these estimates considered cost reduction initiatives known as production cost reduction plans. Hundreds of these plans-totaling $21 billion--had been identified by the airframe and engine contractors, with participation by the Air Force's F-22 program office.
DTIC
Aircraft Production; Production Costs; Cost Reduction; Congressional Reports; F-22 Aircraft

20000076057 CSA Engineering, Inc., Palo Alto, CA USA
An Experimental Investigation of Tangential Blowing to Reduce to Buffet Response of the Vertical Tails of an F-15 Wind Tunnel Model. Volume 2 Response Data *Final Report, 1 Jun. 1996-31 Dec. 1998*
Ferman, Marty A.; Turner, Elijah W.; Jan. 1999; 624p; In English
Contract(s)/Grant(s): F33615-94-C-3200; AF Proj. 2404
Report No.(s): AD-A377712; AFRL-VA-WP-TR-1999-3019; No Copyright; Avail: CASI; A99, Hardcopy; A06, Microfiche
This is Volume 2 of AN EXPERIMENTAL INVESTIGATION OF TANGENTIAL BLOWING TO REDUCE BUFFET RESPONSE OF THE VERTICAL TAILS OF AN F-15 WIND TUNNEL MODEL. This volume presents the detailed PSD graphs and summary tables of rms response data from those graphs. to aid with the comprehension of this data, figures from Volume 1 showing the model, setup, and model instrumentation are repeated here. The reader will most likely have to refer to Volume 1 of added tie-in.
DTIC
F-15 Aircraft; Wind Tunnel Models; Aircraft Models; Buffeting; Wind Tunnel Tests

20000076484 Federal Aviation Administration, Office of Aviation Research, Washington, DC USA
Aircraft Materials Fire Test Handbook *Final Report*
Horner, A.; Apr. 2000; 252p; In English
Report No.(s): PB2000-106510; DOT/FAA/AR-00/12; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche
The purpose of the Aircraft Materials Fire Test Handbook is to describe all FAA-required fire tests methods for aircraft materials in a consistent and detailed format. The handbook provides information to enable the user to assemble and properly use the test methods. Moreover, to broaden the utility of the handbook, the appendices contain the following information: FAA fire safety regulations, FAA approval process, aircraft materials, regulatory methodology used by other countries, aircraft industry internal test methods and guidelines, laboratories actively using fire test methods, and commercial manufacturers of fire test equipment.
NTIS
Fire Prevention; Handbooks; Aircraft Construction Materials; Regulations; Flammability

20000076600 Army Research Lab., Human Research and Engineering Directorate, Aberdeen Proving Ground, MD USA
The Effect of Helicopter Main Rotor Blade Damage on the Rotor Disk (Whole Rotor) Motion *Final Report, Aug.-Oct. 1995*
Fries, Joseph; Jun. 2000; 41p; In English
Report No.(s): AD-A378211; ARL-TR-2241; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
When a helicopter main rotor blade is ballistically damaged, an imbalance is created in the rotor, causing the rotor disk to execute unwanted motions, which are detrimental to performance. The normally smooth-flying helicopter develops new vibrations that can be physiologically annoying or debilitating to the pilot, can exceed structural fatigue endurance limits, can cause aeromechanical instabilities, and can reduce helicopter performance ability. This report examines the effect of the loss of the outboard section of one rotating blade of a rotor set of four blades on the fixed-system (nonrotating) rotor disk motion. The report shows, beginning with the rotor blade forcing, how a damaged blades response changes, and how this change feeds into the rotor's fixed-system disk motion (the disk referring to the blades acting in concert as a whole entity). With a normally undamaged rotor (referring to all the blades), there exists within the rotor itself the capability of motion canceling of certain frequencies depending on the number of rotor blades in the rotor. This study tracks each individual harmonic (integer multiples of the rotor speed) frequency, one at a time, in order to obtain a first-principles understanding of the phenomena involved with rotor imbalance.
DTIC
Helicopters; Rotary Wings; Rotors; Damage; Fatigue (Materials); Helicopter Performance; Rotor Aerodynamics; Aircraft Reliability

20000076816 NASA Johnson Space Center, Houston, TX USA

X-38 Landing Gear Skid Test Report

Gafka, George K., NASA Johnson Space Center, USA; Daugherty, Robert H., NASA Langley Research Center, USA; June 2000; 116p; In English

Contract(s)/Grant(s): RTOP 522-62-11-02

Report No.(s): NASA/TM-2000-210293; NAS 1.15:210293; L-18968; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

NASA incorporates skid-equipped landing gear on its series of X-38 flight test vehicles. The X-38 test program is the proving ground for the Crew Return Vehicle (CRV) a gliding parafoil-equipped vehicle designed to land at relatively low speeds. The skid-equipped landing gear is designed to attenuate the vertical landing energy of the vehicle at touchdown using crushable materials within the struts themselves. The vehicle then slides out as the vehicle horizontal energy is dissipated through the skids. A series of tests was conducted at Edwards Airforce Base (EAFB) in an attempt to quantify the drag force produced while "dragging" various X-38 landing gear skids across lakebed regions of varying surface properties. These data were then used to calculate coefficients of friction for each condition. Coefficient of friction information is critical for landing analyses as well as for landing gear load and interface load analysis. The skid specimens included full- and sub-scale V201 (space test vehicle) nose and main gear designs, a V131/V 132 (atmospheric flight test vehicles) main gear skid (actual flight hardware), and a newly modified, full-scale V201 nose -ear skid with substantially increased edge curvature as compared to its original design. Results of the testing are discussed along with comments on the relative importance of various parameters that influence skid stability and other dynamic behavior.

Author

X-38 Crew Return Vehicle; Drag; Dynamic Characteristics; Flight Test Vehicles; Gliding; Landing Gear; Skid Landings; Skidding

20000078419 Dayton Univ. Research Inst., OH USA

Statistical Loads Data for B-767-200ER Aircraft in Commercial Operations *Final Report*

Tipps, D. O.; Rustenburg, J. H.; Skinn, D. A.; Mar. 2000; 92p; In English

Report No.(s): PB2000-106507; URD-TR-99-00072; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The primary objective of this research is to support the FAA Airborne Data Monitoring Systems Research Program by developing new and improved methods and criteria for processing and presenting large commercial transport airplane flight and ground loads usage data. The scope of activities performed involved (1) defining the service-related factors which affect the operational life of commercial aircraft; (2) designing an efficient software system to reduce, store, and process large quantities of optical quick access recorder data; and (3) providing processed data in formats that will enable the FAA to reassess existing certification criteria. Equally important, these new data will also enable the FAA, the aircraft manufacturers, and the airlines to better understand and control those factors which influence the structural integrity of commercial transport aircraft. Presented are analyses and statistical summaries of data collected from 1285 flights representing 9164 flight hours of 10 typical B-767-200ER aircraft during operational usage recorded by a single airline. The data include statistical information on accelerations, speeds, altitudes, flight duration and distance, gross weights, speed brake/spoiler cycles, thrust reverser usage, and gust velocities encountered.

NTIS

Boeing 767 Aircraft; Flight Load Recorders; Flight Characteristics; Loads (Forces)

20000079969 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

A Hybrid Jump Search and Tabu Search Metaheuristic for the Unmanned Aerial Vehicle (UAV) Routing Problem

Kinney, Gary W., Jr; Mar. 2000; 68p; In English

Report No.(s): AD-A378103; AFIT/GOA/ENS/00M-5; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

In this research, we provide a new meta-heuristic, a jump search I tabu search hybrid, for addressing the vehicle routing problem with real-life constraints. A tour construction heuristic creates candidate solutions or jump points for the problem. A tabu search algorithm uses these jump points as starting points for a guided local search. We provide statistical analysis on the performance of our algorithm and compare it to other published algorithms. Our algorithm provides solutions within 10% of the best known solutions to benchmark problems and does so in a fraction of the time required by competing algorithms. The timeliness of the solution is vitally import to the unmanned aerial vehicle (UAV) routing problem. UAVs provide the lion's share of reconnaissance support for the US military. This reconnaissance mission requires the UAVs to visit hundreds of target areas in a rapidly changing combat environment. Air vehicle operators (AVOs) must prepare a viable mission plan for the UAVs while

contending with such real-life constraints as time windows, target priorities, multiple depots, heterogeneous vehicle fleet, and pop-up threats. Our algorithm provides the AVOs with the tools to perform their mission quickly and efficiently.
DTIC
Algorithms; Pilotless Aircraft; Statistical Analysis; Routes; Aerial Reconnaissance

20000079970 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
A Java Universal Vehicle Router in Support of Routing Unmanned Aerial Vehicles
Harder, Robert W.; Mar. 2000; 72p; In English
Report No.(s): AD-A378105; AFIT/GOR/ENS/00M-16; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Unmanned Aerial Vehicles (UAVs) help the military gather information in times of peace and war. During a mission, typically 100 sites or more, a UAV will frequently be re-tasked to visit a pop-up threat, leaving the operator to determine the best way to finish the day's list of sites after the re-tasking. I develop a prototype application to serve the needs of a specific customer, the 11th Reconnaissance Squadron, by helping them preplan missions and dynamically re-task UAVs. This prototype application is built on a reusable airframe router called the core AFIT Router, which can later be added to more sophisticated mapping and planning software for other customers. The core AFIT Router is built on a new architecture, defined and implemented in this research, which calls for tools that solve entire classes of problems. to support the UAV routing problem, I develop such an architecture for Vehicle Routing Problems (VRPs) and Traveling Salesman Problems (TSPs) and call it the Universal Vehicle Router (UVR). The UVR allows for many solving techniques to be plugged in, and two sample solvers are included, one a tour-building heuristic by Gary Kinney and the other an adaptive tabu search developed in this research.
DTIC
Traveling Salesman Problem; Reconnaissance; Pilotless Aircraft; Heuristic Methods; Routes

20000079973 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA
A Comparison of Methods for Measurement of Pressure in Hydraulic Lines
Sprague, Susan; Chorney, Andrew; Jan. 2000; 60p; In English
Report No.(s): AD-A378010; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This presentation summarizes a study characterizing strain gages and pressure transducers used to measure the fluid pressure within aircraft hydraulic lines. A series of laboratory calibrations and finite element analyses was performed to demonstrate the quality of data from both pressure transducers and strain gages under variations in both temperature and external strains on the hydraulic lines. Strain gages showed a marked susceptibility to external strains on hydraulic lines, and wide variations in susceptibility to temperature changes. Pressure transducers were found to be relatively immune to both conditions. It is recommended that strain gages be used for trend data only.
DTIC
Finite Element Method; Fluid Pressure; Pressure Measurement; Strain Gages; Aircraft Equipment; Hydraulic Equipment

20000079998 NASA Dryden Flight Research Center, Edwards, CA USA
An Evaluation Technique for an F/A-18 Aircraft Loads Model Using F/A-18 Systems Research Aircraft Flight Data
Olney, Candida D., NASA Dryden Flight Research Center, USA; Hillebrandt, Heather, NASA Dryden Flight Research Center, USA; Reichenbach, Eric Y., Boeing Co., USA; July 2000; 30p; In English; 31st SFTE Annual Symposium 2000, 18-22 Sep. 2000, Torino, Italy
Contract(s)/Grant(s): RTOP 529-61-14
Report No.(s): NASA/TM-2000-209028; NAS 1.15:209028; H-2423; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A limited evaluation of the F/A-18 baseline loads model was performed on the Systems Research Aircraft at NASA Dryden Flight Research Center (Edwards, California). Boeing developed the F/A-18 loads model using a linear aeroelastic analysis in conjunction with a flight simulator to determine loads at discrete locations on the aircraft. This experiment was designed so that analysis of doublets could be used to establish aircraft aerodynamic and loads response at 20 flight conditions. Instrumentation on the right outboard leading edge flap, left aileron, and left stabilator measured the hinge moment so that comparisons could be made between in-flight-measured hinge moments and loads model-predicted values at these locations. Comparisons showed that the difference between the loads model-predicted and in-flight-measured hinge moments was up to 130 percent of the flight limit load. A stepwise regression technique was used to determine new loads derivatives. These derivatives were placed in the loads model, which reduced the error to within 10 percent of the flight limit load. This paper discusses the flight test methodology, a

process for determining loads coefficients, and the direct comparisons of predicted and measured hinge moments and loads coefficients.
Author
Aeroelasticity; Wing Loading; F-18 Aircraft; Aircraft Models; Flight Tests; Flight Conditions; Flight Simulators

20000080000 NASA Langley Research Center, Hampton, VA USA
Low Order Equivalent System Identification for the TU-144LL Supersonic Transport Aircraft
Morelli, Eugene A., NASA Langley Research Center, USA; [2000]; 14p; In English; Atmospheric Flight Mechanics Conference, 14-17 Aug. 2000, Denver, CO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper-2000-3902; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

Low order equivalent system models were identified from flight test data for the TU-144LL supersonic transport aircraft. Flight test maneuvers were executed by Russian and American test Pilots flying the aircraft from Zhukovsky airfield outside Moscow, Russia. Flight tests included longitudinal and lateral / directional maneuvers at supersonic cruise flight conditions. Piloted frequency sweeps and multi-step maneuvers were used to generate data for closed loop low order equivalent system modeling. Model parameters were estimated using a flexible. high accuracy Fourier transform and an equation error / output error (EE/OE) formulation in the frequency domain. Results were compared to parameter estimates obtained using spectral estimation and subsequent least squares fit to frequency response data in Bode plots. Modeling results from the two methods agreed well for both a frequency sweep and multiple concatenated multi-step maneuvers. For a single multi-step maneuvers the EE/OE method gave a better model fit with improved prediction capability. A summary of closed loop low order equivalent system identification results for the TU-144LL, including estimated parameters, standard errors, and flying qualities level predictions, were computed and tabulated.
Author
System Identification; Control Systems Design; Feedback Control; High Speed; Supersonic Speed; Research Vehicles

20000080038 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA
Using Simulation to Optimize Ski Jump Ramp Profiles for STOVL Aircraft
Imhof, Greg; Schork, Bill; Dec. 01, 1999; 3p; In English
Report No.(s): AD-A378145; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Ramps have been used for many years aboard the Navy ships of many Countries to reduce takeoff run distance and wind-over-deck (WOD) requirements, as well as to increase the aircraft takeoff gross weight capability over that of a flat deck carrier. Under the Joint Strike Fighter program, an effort has been funded to evaluate various ramp profiles and ramp performance Optimization methodologies. Results of these evaluations will be used with an advanced STOVL aircraft to provide the maximum benefit to takeoff performance, while not becoming a design driver for landing gear of adversely affecting ship designs.
DTIC
STOVL Aircraft; Simulation; Skis; Takeoff; Ramps (Structures)

20000080063 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA
Error Detection and Correction -- An Emperical Method for Evaluating Techniques
Rymer, J. W.; Jan. 2000; 15p; In English
Report No.(s): AD-A377970; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper describes a method for evaluating error correction techniques for applicability to the flight testing of aircraft. No statistical or math assumptions about the channel or sources of error are used. An empirical method is shown which allows direct "with and without" comparative evaluation of correction techniques. A method was developed to extract error sequences from actual test data independent of the source of the dropouts. Hardware was built to allow a stored error sequence to be repetitively applied to test data. Results are shown for error sequences extracted from a variety of actual test data. The effectiveness of Reed-Solomon (R-S) encoding and interleaving is shown. Test bed hardware configuration is described. Criteria are suggested for worthwhile correction techniques and suggestions are made for future investigation.
DTIC
Error Analysis; Software Engineering; Error Correcting Codes; Flight Tests

20000080078 Department of Defense, Office of Inspector General, Arlington, VA USA
C-17 Wing Structural Integrity
Huston, Michael G., Department of Defense, USA; Stavenjord, Kenneth H., Department of Defense, USA; Sankhla, Chandra P., Department of Defense, USA; Donnellon, Gregory R., Department of Defense, USA; Ricker, Richard E., Department of Defense,

USA; Aug. 24, 1993; 29p; In English
Report No.(s): AD-A376299; IG/DOD-93-159; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The objective of the technical assessment was to evaluate the structural integrity of the wing in view of the wing static test failure and the McDonnell Douglas Aircraft Company's (MDA's) repair plans. We evaluated the root cause analyses of the wing static test failure and the validation of the retrofit design.

DTIC

Transport Aircraft; Aircraft Maintenance; Structural Failure; Structural Stability; Evaluation

20000080095 Cornell Univ., Faculty of the Graduate School, Ithaca, NY USA

Crack Turning in Integrally Stiffened Aircraft Structures

Pettit, Richard Glen, Cornell Univ., USA; August 2000; 235p; In English

Contract(s)/Grant(s): NAG1-2013; NAG1-2268; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

Current emphasis in the aircraft industry toward reducing manufacturing cost has created a renewed interest in integrally stiffened structures. Crack turning has been identified as an approach to improve the damage tolerance and fail-safety of this class of structures. A desired behavior is for skin cracks to turn before reaching a stiffener, instead of growing straight through. A crack in a pressurized fuselage encounters high T-stress as it nears the stiffener--a condition favorable to crack turning. Also, the tear resistance of aluminum alloys typically varies with crack orientation, a form of anisotropy that can influence the crack path. The present work addresses these issues with a study of crack turning in two-dimensions, including the effects of both T-stress and fracture anisotropy. Both effects are shown to have relation to the process zone size, an interaction that is central to this study. Following an introduction to the problem, the T-stress effect is studied for a slightly curved semi-infinite crack with a cohesive process zone, yielding a closed form expression for the future crack path in an infinite medium. For a given initial crack tip curvature and tensile T-stress, the crack path instability is found to increase with process zone size. Fracture orthotropy is treated using a simple function to interpolate between the two principal fracture resistance values in two-dimensions. An extension to three-dimensions interpolates between the six principal values of fracture resistance. Also discussed is the transition between mode I and mode II fracture in metals. For isotropic materials, there is evidence that the crack seeks out a direction of either local symmetry (pure mode I) or local asymmetry (pure mode II) growth. For orthotropic materials the favored states are not pure modal, and have mode mixity that is a function of crack orientation.

Derived from text

Cracks; Crack Tips; Surface Cracks; Crack Geometry; Crack Propagation; Fracturing; Fracture Strength; Tensile Stress

08
AIRCRAFT STABILITY AND CONTROL

Includes flight dynamics, aircraft handling qualities; piloting; flight controls; and autopilots.

20000072424 NASA Marshall Space Flight Center, Huntsville, AL USA

Sliding Mode Control of the X-33 with an Engine Failure

Shtessel, Yuri B., Alabama Univ., USA; Hall, Charles E., NASA Marshall Space Flight Center, USA; [2000]; 18p; In English; Joint Propulsion Conference, 17-19 Jul. 2000, Huntsville, AL, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

Ascent flight control of the X-3 is performed using two XRS-2200 linear aerospike engines. in addition to aerosurfaces. The baseline control algorithms are PID with gain scheduling. Flight control using an innovative method. Sliding Mode Control. is presented for nominal and engine failed modes of flight. An easy to implement, robust controller. requiring no reconfiguration or gain scheduling is demonstrated through high fidelity flight simulations. The proposed sliding mode controller utilizes a two-loop structure and provides robust. de-coupled tracking of both orientation angle command profiles and angular rate command profiles in the presence of engine failure, bounded external disturbances (wind gusts) and uncertain matrix of inertia. Sliding mode control causes the angular rate and orientation angle tracking error dynamics to be constrained to linear, de-coupled, homogeneous, and vector valued differential equations with desired eigenvalues. Conditions that restrict engine failures to robustness domain of the sliding mode controller are derived. Overall stability of a two-loop flight control system is assessed. Simulation results show that the designed controller provides robust, accurate, de-coupled tracking of the orientation angle command profiles in the presence of external disturbances and vehicle inertia uncertainties, as well as the single engine failed case.

The designed robust controller will significantly reduce the time and cost associated with flying new trajectory profiles or orbits, with new payloads, and with modified vehicles
Author
Flight Control; X-33 Reusable Launch Vehicle; Engine Failure; Angular Velocity; Aerospike Engines

20000073727 NASA Langley Research Center, Hampton, VA USA
Steady-State Computation of Constant Rotational Rate Dynamic Stability Derivatives
Park, Michael A., Joint Inst. for Advancement of Flight Sciences, USA; Green, Lawrence L., NASA Langley Research Center, USA; 2000; 20p; In English; 18th; Applied Aerodynamics, 14-17 Aug. 2000, Denver, CO, USA
Report No.(s): AIAA Paper 2000-4321; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

Dynamic stability derivatives are essential to predicting the open and closed loop performance, stability, and controllability of aircraft. Computational determination of constant-rate dynamic stability derivatives (derivatives of aircraft forces and moments with respect to constant rotational rates) is currently performed indirectly with finite differencing of multiple time-accurate computational fluid dynamics solutions. Typical time-accurate solutions require excessive amounts of computational time to complete. Formulating Navier-Stokes (N-S) equations in a rotating noninertial reference frame and applying an automatic differentiation tool to the modified code has the potential for directly computing these derivatives with a single, much faster steady-state calculation. The ability to rapidly determine static and dynamic stability derivatives by computational methods can benefit multidisciplinary design methodologies and reduce dependency on wind tunnel measurements. The CFL3D thin-layer N-S computational fluid dynamics code was modified for this study to allow calculations on complex three-dimensional configurations with constant rotation rate components in all three axes. These CFL3D modifications also have direct application to rotorcraft and turbomachinery analyses. The modified CFL3D steady-state calculation is a new capability that showed excellent agreement with results calculated by a similar formulation. The application of automatic differentiation to CFL3D allows the static stability and body-axis rate derivatives to be calculated quickly and exactly.
Author
Steady State; Rotation; Dynamic Stability; Computation; Stability Derivatives; Finite Difference Theory

20000080122 NASA Dryden Flight Research Center, Edwards, CA USA
Flying Quality Analysis of a JAS 39 Gripen Ministick Controller in an F/A-18 Aircraft
Carter, John F., NASA Dryden Flight Research Center, USA; Stoliker, P. C., NASA Dryden Flight Research Center, USA; August 2000; 20p; In English; Guidance Navigation and Control Conference, 14-17 Aug, 2000, Denver, CO, USA
Contract(s)/Grant(s): RTOP 529-61-14
Report No.(s): NASA/TM-2000-209024; NAS 1.15:209024; H-2418; AIAA Paper-2000-4444; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

NASA Dryden conducted a handling qualities experiment using a small displacement centerstick controller that Saab-Scania developed for the JAS 39 Gripen aircraft. The centerstick, or ministick, was mounted in the rear cockpit of an F/A-18 aircraft. Production support flight control computers (PSFCC) provided a pilot-selectable research control system. The objectives for this experiment included determining whether the mechanical characteristics of the centerstick controller had any significant effect on the handling qualities of the F/A-18, and determining the usefulness of the PSFCCs for this kind of experiment. Five pilots evaluated closed-loop tracking tasks, including echelon and column formation flight and target following. Cooper-Harper ratings and pilot comments were collected for each maneuver. This paper describes the test system, including the PSFCCs, the Gripen centerstick, and the flight test experiment. The paper presents results of longitudinal handling qualities maneuvers, including low order equivalent systems, Neal-Smith, and controls anticipation parameter analyses. The experiment showed that, while the centerstick controller provided a different aircraft feel, few handling qualities deficiencies resulted. It also demonstrated that the PSFCCs were useful for this kind of investigation.
Author
Qualitative Analysis; Flight Tests; JAS-39 Aircraft; Airborne/Spaceborne Computers; Displacement; Feedback Control; Production Management

09
RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, runways, hangars, and aircraft repair and overhaul facilities; wind tunnels, water tunnels, and shock tubes; flight simulators; and aircraft engine test stands. Also includes airport ground equipment and systems.

20000074745 Bundesamt fuer Kartographie und Geodaesie, Wettzell, Germany
Transportable Integrated Geodetic Observatory (TIGO)
Hase, Hayo, Bundesamt fuer Kartographie und Geodaesie, Germany; Boeer, Armin, Bundesamt fuer Kartographie und Geodaesie, Germany; Riepl, Stefan, Bundesamt fuer Kartographie und Geodaesie, Germany; Schlueter, Wolfgang, Bundesamt fuer Kartographie und Geodaesie, Germany; International VLBI Service for Geodesy and Astrometry: 2000 General Meeting Proceedings; May 2000, pp. 383-387; In English; See also 20000074683; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

TIGO is a transportable fundamental station for geodesy. TIGO consists of VLBI and SLR modules as well as of a so called basic service module which comprise a GPS array, atomic clock ensemble, superconducting gravity meter, seismometer, meteorological sensors including a water vapour radiometer and a server for the LAN. The energy module allows the operation of TIGO at remote sites with little infrastructure. The primary purpose of TIGO is to contribute to the realization of global reference systems for geodesy (ITRF). Its transportability allows us to place TIGO at a site which improves homogeneity in the network of fundamental stations within the ITRF, if the necessary support of the hosting country can be made available to this project. After an Announcement of Opportunity for hosting TIGO and a reconnaissance of proposed sites as well as some analysis concerning the optimal use of TIGO, the Chilean city of Concepcion got the highest priority for hosting TIGO beginning 2001. Author

Geodesy; Very Long Base Interferometry; Geophysical Observatories

10
ASTRONAUTICS (GENERAL)

Includes general research topics related to space flight and manned and unmanned space vehicles, platforms or objects launched into, or assembled in, outer space; and related components and equipment. Also includes manufacturing and maintenance of such vehicles or platforms.

20000076821 Howard Univ., Washington, DC USA
Control of Formation Flying Satellites *Final Report, 13 May 1999-12 May 2000*
Bainum, Peter M.; Strong, Avaine; Tan, Zhaozhi; May 26, 2000; 127p; In English
Contract(s)/Grant(s): MDA972-99-C-0020; DARPA ORSER-H899
Report No.(s): AD-A378318; 0002-AD; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This report summarizes the work completed during the reporting period cited above. A technique for maintaining nominal separation distance between adjacent satellites in an elliptically orbiting constellation is developed and parametric trade-off studies performed. This technique is based on an initial impulsive-type correction of the daughter spacecraft at the first perigee in order to shift the direction of the line of apsides by a small angle. The technique works well in Keplerian orbits. In the presence of perturbations the results are critically dependent on the amplitude of the shift angle. Without subsequent corrections near collision situations can exist over the long term. Additional feedback type of correctional control is recommended to prevent unwanted secular drifts. Two types of feedback control strategies are considered here: an application of the linear quadratic regulator (LQR) theory based on errors in position, and also based on a Lyapunov function using osculating orbital elements. A preliminary deployment strategy is introduced based on near Hohmann-type of transfer orbits, and shows deployment can be achieved in one orbit.
DTIC

Artificial Satellites; Flight Control; Feedback Control

20000074083 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
A Light-Weight Inflatable Hypersonic Drag Device for Planetary Entry
McRonald, Angus D., Jet Propulsion Lab., California Inst. of Tech., USA; [2000]; 2p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

The author has analyzed the use of a light-weight inflatable hypersonic drag device, called a ballute, for flight in planetary atmospheres, for entry, aerocapture, and aerobraking. Studies to date include Mars, Venus, Earth, Saturn, Titan, Neptune and

Pluto, and data on a Pluto lander and a Mars orbiter will be presented to illustrate the concept. The main advantage of using a ballute is that aero, deceleration and heating in atmospheric entry occurs at much smaller atmospheric density with a ballute than without it. For example, if a ballute has a diameter 10 times as large as the spacecraft, for unchanged total mass, entry speed and entry angle,the atmospheric density at peak convective heating is reduced by a factor of 100, reducing the heating by a factor of 10 for the spacecraft and a factor of 30 for the ballute. Consequently the entry payload (lander, orbiter, etc) is subject to much less heating, requires a much reduced thermal. protection system (possibly only an MLI blanket), and the spacecraft design is therefore relatively unchanged from its vacuum counterpart. The heat flux on the ballute is small enough to be radiated at temperatures below 800 K or so. Also, the heating may be reduced further because the ballute enters at a more shallow angle, even allowing for the increased delivery angle error. Added advantages are less mass ratio of entry system to total entry mass, and freedom from the low-density and transonic instability problems that conventional rigid entry bodies suffer, since the vehicle attitude is determined by the ballute, usually released at continuum conditions (hypersonic for an orbiter, and subsonic for a lander). Also, for a lander the range from entry to touchdown is less, offering a smaller footprint. The ballute derives an entry corridor for aerocapture by entering on a path that would lead to landing, and releasing the ballute adaptively, responding to measured deceleration, at a speed computed to achieve the desired orbiter exit conditions. For a lander an accurate landing point could be achieved by providing the lander with a small gliding capacity, using the large potential energy available from being subsonic at high altitude. Alternatively the ballute can be retained to act as a parachute or soft-landing device, or to float the payload as a buoyant aerobot. As expected, the ballute has smaller size for relatively small entry speeds, such as for Mars and Titan, or for the extensive atmosphere of a low-gravity planet such as Pluto. Details of a ballute to place a small Mars orbiter and a small Pluto lander will be given to illustrate the concept. The author will discuss presently available ballute materials and a development program of aerodynamic tests and materials that would be required for ballutes to achieve their full potential.
Author
Aerodynamic Heating; Research; Ballutes; Buoyancy; Drag Devices; Floats; Inflatable Structures; Microgravity; Planetary Atmospheres; Spacecraft Design

20000074112 Alabama A & M Univ., Dept. of Mechanical Engineering, Huntsville, AL USA
Preliminary Analysis and Design of a Rocket Based Combined Cycle for Efficient Access to Space
Harris, Lawanna, Alabama A & M Univ., USA; Barboka, James, Alabama A & M Univ., USA; Rojas–Oviedo, Ruben, Alabama A & M Univ., USA; Deng, Z. T., Alabama A & M Univ., USA; 20000719; 1p; In English; 36th; 36th Joint Propulsion Conference, 17-19 Jul. 2000, Huntsville, AL, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Copyright Waived; Avail: Issuing Activity; Abstract Only

Access to space is presently limited by cost. The cost of delivering a payload to low earth orbit (LEO) is on average $10,000 per pound of payload, in the USA. Much of this cost is incurred from the operation of vehicles developed with 30-40 year old technology. The old technology and design practices have resulted in expensive hardware and intensive maintenance requirements for current launch vehicles. In order to alleviate the cost factor, the technological advances throughout the next millennium must bring affordable development and a new invigorating desire to space exploration. National Aeronautical and Space Administration (NASA), Department of Defense (DOD), and private industry are addressing this issue by focusing on incremental improvements in the Earth- to Orbit (ETO) costs. These improvements have investigated two different approaches: 1) make space vehicles as inexpensive as possible (i.e. Evolved Expendable Launch Vehicle (EELV) and Delta IV) 2) make space vehicles as reusable as airplanes so that the initial cost of investment can be recaptured (i.e. Reusable Launch Vehicle (RLV), X-33, X-34, and X-37) These programs have made notable progress in new material, propulsion, structures, and avionics technologies, during the last 3-5 years. So far, these programs are targeted to reduce present costs by, as much as, five times the current cost. The year 2025 goal for continued space advancement is to have ETO costs reduced by a factor of ten (i.e., tenfold), as low as $100 - $200/lb payload. For the RLV, this goal translates into very low maintenance costs and higher expected reliability per flight must be obtained. Therefore, making higher launch rates possible. For the expendable vehicle, the cost of maintenance cost is minimal, but a greater reliability must exist to insure the payload; since, there would be no way to recover the payload if the mission was to an abort or failure. Overall the cost of vehicle, payload and operations of an expendable may be too high compared to those of the RLV.
Author
Rocket-Based Combined-Cycle Engines; Payloads; Low Earth Orbits; Operating Costs; Avionics

20000076055 Aerospace Corp., Technology Operations, El Segundo, CA USA
Full-Scale DELTA GEM MPS Demonstration - May 11-12, 1999 AFRL/EAFB Rocket Laboratory
Osborn, J.; Brown, B.; Amimoto, S.; Fournier, E.; Nov. 15, 1999; 20p; In English
Contract(s)/Grant(s): F04701-93-C-0094
Report No.(s): AD-A377699; TR-99(1494)-2; SMC-TR-00-11; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A prototype Multiparameter Sensor System (MPS) is described for impact detection and environmental condition monitoring of graphite epoxy composite structures. This system is applied to a full-scale inert Delta-II solid rocket Graphite Epoxy Motor (GEM) casing. Microelectro-mechanical (MEMS) sensors are used in this demonstration, including those for 3-axis acceleration, temperature, pressure and humidity. All sensor measurements are made within a single package mounted at the center of mass of the test article. Sensor analog outputs are sampled with a National Instruments Inc. data acquisition PCMCIA card, and data is processed on a Pentium-II 200 MHz laptop computer. Sensor information collected during this demonstration was passed wirelessly to a remote user terminal for display and data storage. Data presented in this report includes peak acceleration for impacts just below damage threshold, environmental sensor trends, and wireless RF performance in a warehouse environment. DTIC

Solid Propellant Rocket Engines; Flight Simulation; Computerized Simulation; Microelectromechanical Systems; Rocket Engine Cases

11
CHEMISTRY AND MATERIALS (GENERAL)

Includes general research topics related to the composition, properties, structure, and use of chemical compounds and materials as they relate to aircraft, launch vehicles, and spacecraft.

20000074965 NASA Marshall Space Flight Center, Huntsville, AL USA

Energetic Combustion Devices for Aerospace Propulsion and Power

Litchford, Ron J., NASA Marshall Space Flight Center, USA; [2000]; 1p; In English; 11th; Advanced Space Propulsion Research, 31 May - 2 Jun. 2000, Pasadena, CA, USA; Sponsored by Jet Propulsion Lab., California Inst. of Tech., USA; No Copyright; Avail: Issuing Activity; Abstract Only

Chemical reactions have long been the mainstay thermal energy source for aerospace propulsion and power. Although it is widely recognized that the intrinsic energy density limitations of chemical bonds place severe constraints on maximum realizable performance, it will likely be several years before systems based on high energy density nuclear fuels can be placed into routine service. In the mean time, efforts to develop high energy density chemicals and advanced combustion devices which can utilize such energetic fuels may yield worthwhile returns in overall system performance and cost. Current efforts in this vein are being carried out at NASA MSFC under the direction of the author in the areas of pulse detonation engine technology development and light metals combustion devices. Pulse detonation engines are touted as a low cost alternative to gas turbine engines and to conventional rocket engines, but actual performance and cost benefits have yet to be convincingly demonstrated. Light metal fueled engines also offer potential benefits in certain niche applications such as aluminum/CO2 fueled engines for endo-atmospheric Martian propulsion. Light metal fueled MHD generators also present promising opportunities with respect to electric power generation for electromagnetic launch assist. This presentation will discuss the applications potential of these concepts with respect to aero ace propulsion and power and will review the current status of the development efforts. Author

Combustion; Carbon Dioxide; Engine Design; Gas Turbine Engines; Rocket Engines; Spacecraft Propulsion

12
ENGINEERING (GENERAL)

Includes general research topics to engineering and applied physics, and particular areas of vacuum technology, industrial engineering, cryogenics, and fire prevention.

20000076820 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA

Development of a High Capacity Lithium-Ion Battery for a Navy Aircraft

Stein, Brian J.; Baker, John W.; Shah, Pinakin M.; Isaacs, Nathan D.; Johnson, Bill; Jan. 2000; 13p; In English; Prepared in collaboration with Mine Safety Appliances Co., Sparks, MD.

Report No.(s): AD-A378170; TR-1821; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In response to the Navy's requirement for a lighter, higher capacity, secondary battery, Mine Safety Appliances (MSA) Company designed and built an experimental lithium-ion "drop-in" replacement battery for demonstration of its performance in the Pioneer aircraft. Lithium ion technology using a lithiated cobalt dioxide positive electrode, graphitized carbon negative electrode and liquid organic electrolyte has demonstrated a significant enhancement in performance over other rechargeable systems such as nickel-cadmium and nickel-metal hydride in comparable applications. Key features of the lithium ion system

include higher gravimetric and volumetric energy densities, good charge retention (to maximize readiness), and zero memory effect. Such benefits outweigh a higher unit cost and the need for more stringent charge/discharge control. Design of the cells and battery, and preliminary battery test results are described.
DTIC
Lithium Batteries; Product Development; Aircraft Equipment

20000075724 Illinois Univ. at Urbana-Champaign, Urbana, IL USA
Smart Mesoflaps for Aeroelastic Transpiration for SBLI Flow Control *Final Report, 15 Mar.-30 Nov. 1998*
Loth, Eric; Geubelle, Philippe; White, Scott; Tortorelli, Daniel; Dutton, Craig; May 2000; 11p; In English
Contract(s)/Grant(s): F49620-98-1-0381; AF Proj. 2307
Report No.(s): AD-A378320; AFRL-SR-BL-TR-00-0208; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This multi-disciplinary research project investigates the capability and performance of a novel concept termed Smart Mesoflaps for Aeroelastic Transpiration (SMAT), which will provide mass and momentum transfer to control shock/boundary-layer interactions (SBLIs). Such flow control can be critical for supersonic mixed-compression inlets which have impinging oblique-shocks. The SMAT concept consists of a matrix of small flaps (sub-millimetric in thickness) covering an enclosed cavity. These flaps are designed to undergo local aeroelastic deflection to achieve proper mass bleed or injection when subjected to impinging oblique shocks. The resulting system is designed to efficiently reduce and prevent flow separation caused by SBLIs. The expected pay-offs in aircraft performance are a lighter, smaller, and more robust bleed system for supersonic inlets with reduced compressor-face inlet distortion. This study closely integrates experimental and computational investigations of the SMAT concept in relevant SBLI flowfields. The numerical studies employ an aeroelastic finite element code to investigate the physics between the supersonic turbulent boundary layer, the subsonic cavity flow, and the deforming mesoflaps. These analyses are coupled to advanced shape-optimization techniques such that mesoflap design can be optimized for a given flow condition. The resulting methodology is being used to guide the fabrication of the mesoflaps using both conventional metal alloys and smart materials. Aerodynamic experiments will be conducted for various flap arrays to investigate fundamental flow phenomenon and measure aerodynamic performance.
DTIC
Aeroelasticity; Boundary Layer Separation; Turbulent Boundary Layer; Transpiration; Flaps (Control Surfaces); Compressible Flow; Supersonic Flow; Supersonic Inlets; Finite Element Method; Flapping

20000074792 NASA Goddard Space Flight Center, Greenbelt, MD USA
A New ER-2 Lidar System and Implications for Doppler Lidar Simulation
McGill, M., NASA Goddard Space Flight Center, USA; [2000]; 1p; In English; Lidar Working Group Meeting, 21-23 Jun. 2000, Boulder, CO, USA; No Copyright; Avail: Issuing Activity; Abstract Only

A new high-altitude remote sensing lidar is nearing completion at NASA-Goddard. The lidar will replace the existing Cloud Lidar System and will provide measurements of cloud and aerosol parameters at 1064, 532, and 355 nm. It is anticipated that the aerosol backscatter data from this instrument will be highly valuable for producing spaceborne simulations of Doppler lidar systems. Such simulations are possible, as has been previously demonstrated using data from the old Cloud Lidar System. The new lidar will allow improved simulation capability, particularly at 355 nm, which is a primary candidate wavelength for spaceborne Doppler systems. Descriptions of the new lidar will be shown, the science capabilities will be described, and the potential impact on future spaceborne simulations will be discussed.
Author
Doppler Radar; Remote Sensing; U-2 Aircraft; Computerized Simulation; Space Based Radar

13
GEOSCIENCES (GENERAL)

Includes general research topics related to the Earth sciences, and the specific areas of petrology, mineralogy, and general geology.

20000073298 NASA Goddard Space Flight Center, Greenbelt, MD USA
Development of a Two Dimensional Synthetic Aperture Radiometer at L-Band
LeVine, D. M., NASA Goddard Space Flight Center, USA; Carver, K., Massachusetts Univ., USA; Goodberlet, M., Quadrant Engineering, Inc., USA; Popstefanija, I., Quadrant Engineering, Inc., USA; Mead, J., Quadrant Engineering, Inc., USA; [2000]; 1p; In English; Geoscience and Remote Sensing, 24-28 Jul. 2000, Honolulu, HI, USA; No Copyright; Avail: Issuing Activity; Abstract Only

A radiometer that uses aperture synthesis in two dimensions is being built as part of research under NASA's Instrument Incubator Program. The instrument development team consists of engineers at the Goddard Space Flight Center, the University of Massachusetts and Quadrant Engineering. This will be an aircraft instrument operating at L-band which builds on the heritage of ESTAR. The choice of L-band was made because the problem of achieving adequate resolution in space is most critical at this wavelength and because a polarimetric, conical scanning airborne radiometer for future experiments to validate soil moisture and ocean salinity retrieval algorithms is not currently available. The instrument will be designed to fly on the NASA P-3 aircraft in a nadir pointing mode, although other options are possible. The antenna will consist of an array of modules arranged in a rectangular grid. Each module will be comprised of a printed circuit dual-polarized patch and integrated receiver. The distribution of modules within the rectangular array will be adjustable so that several different imaging configurations (e.g. "+","Y", "T") can be employed. The integrated receiver will provide amplification and conversion to IF. The IF signal will be routed to a processor where the required correlations performed. The I and Q channels will be created digitally and the correlations will be done digitally in this processor. The digitization will be done with sufficient bits to study the effects of quantization on radiometer performance. A computer/controller will store the data for conversion to an image and will also perform temperature control and other data interfacing and housekeeping tasks. The instrument is currently in the bread boarding phase of development. A design of the critical components has been completed and hardware is being assembled to test the individual elements. It is expected that a complete 2-channel correlator will be tested by the summer of 2000 and that the complete instrument will be ready for flight tests the following summer (2001).

Author

Synthetic Apertures; Radiometers; Aircraft Instruments; Imaging Techniques; Ultrahigh Frequencies; Flight Tests

20000070671 Risoe National Lab., Wind Energy and Atmospehric Physics Dept., Roskilde, Denmark

Field rotor measurements. Data sets prepared for analysis of stall hysteresis

Aagaard Madsen, H.; Thirstrup Petersen, J.; Bruining, A.; Brand, A.; Graham, M.; May 31, 1998; 103p; In English

Report No.(s): DE99-701961; RISO-R-1046(EN); ISBN 87-550-2385-1; No Copyright; Avail: Department of Energy Information Bridge

As part of the JOULE-3 project 'STALLVIB' an analysis and synthesis of the data from the field rotor experiments at ECN, Delft University, Imperial College, NREL and Risoe has been carried out. This has been done in order to see to what extent the data could be used for further development and validation of engineering dynamic stall models. A detailed investigation of the influence of the post-processing of the different data sets has been performed. Further, important statistical functions such as PSD spectra, coherence and transfer functions have been derived for the data sets which can be used as basis for evaluation of the quality of the data seen relative to actual application of the data. The importance of using an appropriate low-pass filtering to remove high frequency noise has been demonstrated when the relation between instantaneous values of e.g. alpha and C(sub N) is considered. In general, the complicated measurement on a rotor of alpha and w and the interpretation of these parameters combined with the strongly three- dimensional, turbulent flow field around the rotating blade has the consequence that it seems difficult to derive systematic information from the different data sets about stall hysteresis. In particular, the measurement of (alpha), which determination of the stagnation point gives reasonable data below stall but fails in stall. On the other hand, measurements of alpha with a five hole pitot tube can be used also in the stall region. Another main problem is the non-dimensionalization of the coefficients C(sub N) and C(sub r). If the dynamic pressure used for the non-dimensionalization is not fully correlated with the aerodynamic pressure over the considered airfoil section due to e.g. influence of the gravity on the pressure pipes, the hysteresis loops will be distorted. However, using the data with caution and applying a suitable post- processing as described by the different participants, it will probably be possible to obtain some information on stall hysteresis from the field rotor data. An example of use of the data for derivation of the empirical constants in the fgh dynamic stall model is shown at the end of the report.

NTIS

Rotors; Aerodynamic Stalling; Hysteresis; Dynamic Pressure; Three Dimensional Flow

20000074680 Risoe National Lab., Wind Energy and Atmospheric Physics Dept., Roskilde, Denmark

Design of the wind turbine airfoil family RISOe-A-XX

Dahl, K. S.; Fuglsang, P.; Dec. 31, 1998; 30p; In English

Report No.(s): DE99-725998; RISO-R-1024(EN); ISBN 87-550-2356-8; No Copyright; Avail: Department of Energy Information Bridge

A method for design of wind turbine airfoils is presented. The design method is based on direct numerical optimization of a B-spline representation of the airfoil shape. For flexibility, the optimization algorithm relies on separate, stand alone tools for the analysis of aerodynamic and structural properties. The panel method based XFOIL is used during the optimization whereas the Navier-Stokes solver EllipSys2D is used in the evaluation of the results. The method is demonstrated by the design of an airfoil

family composed of 7 airfoils ranging in thickness from 12% to 30%. The design is based on Reynolds and Mach numbers representative of a 600 kW wind turbine. The airfoils are designed to have maximum lift-drag ratio until just below stall, a design lift coefficient of about 1.55 at an angle of attack of 10 deg. and a maximum lift coefficient of 1.65. The airfoils are made insensitive to leading edge roughness by securing that transition from laminar to turbulent flow on the suction side occurs close to the leading edge for post stall angles of attack. The design method and the airfoil family provides a sound basis for further enhancing the characteristics of airfoils for wind turbines and to tailor airfoils for specific rotor sizes and power regulation principles.
NTIS
Wind Turbines; Airfoils; Design Analysis; Aircraft Design; Structural Design; Aircraft Parts; Aircraft Structures

20000078424 NASA Langley Research Center, Hampton, VA USA
A Comparison of Aircraft and Ground-Based Measurements at Mauna Loa Observatory, Hawaii, During GTE PEM-West and MLOPEX 2
Atlas, E., National Center for Atmospheric Research, USA; Ridley, B., National Center for Atmospheric Research, USA; Walega, J., National Center for Atmospheric Research, USA; Greenberg, J., National Center for Atmospheric Research, USA; Kok, G., National Center for Atmospheric Research, USA; Staffelbach, T., National Center for Atmospheric Research, USA; Schauffler, S., National Center for Atmospheric Research, USA; Lind, J., National Center for Atmospheric Research, USA; Huebler, G., National Oceanic and Atmospheric Administration, USA; Norton, R., National Oceanic and Atmospheric Administration, USA; Journal of Geophysical Research; Jun. 20, 1996; ISSN 0148-0227; Volume 101, No. D9, pp. 14,599-14,612; In English
Report No.(s): Paper 96JD00213; Copyright; Avail: Issuing Activity

During October 19-20, 1991, one flight of the NASA Global Tropospheric Experiment (GTE) Pacific Exploratory Mission (PEM-West A) mission was conducted near Hawaii as an intercomparison with ground-based measurements of the Mauna Loa Observatory Photochemistry Experiment (MLOPEX 2) and the NOAA Climate Modeling and Diagnostics Laboratory (CMDL). Ozone, reactive nitrogen species, peroxides, hydrocarbons, and halogenated hydrocarbons were measured by investigators aboard the DC-8 aircraft and at the ground site. Lidar cross sections of ozone revealed a complex air mass structure near the island of Hawaii which was evidenced by large variation in some trace gas mixing ratios. This variation limited the time and spatial scales for direct measurement intercomparisons. Where differences occurred between measurements in the same air masses, the intercomparison suggested that biases for some trace gases was due to different calibration scales or, in some cases, instrumental or sampling biases. Relatively large uncertainties were associated with those trace gases present in the low parts per trillion by volume range. Trace gas correlations were used to expand the scope of the intercomparison to identify consistent trends between the different data sets.
Author
Ground Based Control; Aircraft Control; DC 8 Aircraft; Photochemical Reactions; Climate Models

20000072436 NASA Goddard Space Flight Center, Greenbelt, MD USA
Hurricane Bonnie Landfalling Observed from ER-2 Doppler Radar on 26 August 1998 During CAMEX-3
Heymsfield, G. M., NASA Goddard Space Flight Center, USA; Halverson, J., Maryland Univ. Baltimore County, USA; Tian, L., Universities Space Research Association, USA; Geerts, B., Science Systems and Applications, Inc., USA; [2000]; 2p; In English; 24th; Hurricanes, 29 May - 2 Jun. 2000, Fort Lauderdale, FL, USA; Sponsored by American Meteorological Society, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The NASA ER-2 and DC-8 aircraft collected remote sensing and in situ data sets from Hurricane Bonnie (23, 24, and 26 August 1998) during the Convection And Moisture Experimental-3 (CAMEX-3). Bonnie was an exceptional case where NASA and NOAA had five aircraft sampling both upper levels and lower altitudes. The ER-2 was instrumented with the ER-2 Doppler XBand radar (EDOP) and several radiometers ranging from visible to lower frequency microwaves. EDOP is a fixed dual-beam radar (nadir and forward-looking beams) which allows computation of both vertical and alongtrack horizontal winds. The hurricane secondary circulation is typically difficult to measure at upper levels due to aircraft altitude limitations and sensitivity of the lower altitude airborne radars. EDOP is in principle, well suited to measure these components of the wind. When ER-2 flies across the approximate center of the hurricane circulation, the along-track winds derived from EDOP, are approximately equal to the hurricane radial flow comprising the secondary circulation. Assuming that the hydrometeor fallspeeds can be approximated, the radial and vertical wind components of the secondary circulation can be measured. Since the hydrometeor motions can be estimated with more confidence in the higher altitude ice regions (i.e., graupel and mixed phase are complicated at lower altitudes), the derived radial and vertical winds have higher accuracy at upper levels. On the other hand, the reflectivities are extremely low at higher altitudes, resulting in fewer Doppler velocity estimates.
Derived from text
Doppler Radar; Hurricanes; U-2 Aircraft; Convection; Remote Sensing; DC 8 Aircraft; Atmospheric Moisture

14
LIFE SCIENCES (GENERAL)

Includes general research topics related to plant and animal biology (non-human); ecology; microbiology; and also the origin, development, structure, and maintenance, of animals and plants in space and related environmental conditions.

20000078371 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA
Human Tolerance to Acceleration Loads Generated in High-Performance Helicopters
Shender, Barry S.; Jan. 2000; 43p; In English
Report No.(s): AD-A378150; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The risk to helicopter aircrew of acceleration stress was assessed by investigating the human physiologic response to transitions from - 1 Gz (push) to +4.5 Gz (pull) loads. Nine volunteers participated in a study conducted at the Veridian Operations Centrifuge Facility in Warminster, PA. A 1-hr mission scenario consisting of nine helicopter maneuvers, based on in-flight G measurements (push-pull mission, PPM), simulated both current (CM: .0.2 to +3.3 Gz) and projected future platform capabilities (FM: -1 to +4.5 Gz). Measurements included blood pressure, heart rate (FIR), loss of vision, and subjective fatigue. Visual decrements were minimal during CM while muscular tensing was required to avoid blackout during FM. Light loss typically occurred during the transition from -Gz to +Gz. Within the scope of these tests, subjects tolerated the range of Gz-stresses associated with current USN rotary wing platforms. When subjected to FM G-loads (typical of current USA platforms), cardiovascular stress significantly increased, Gz tolerance dropped as much as 1.2 6, and HR increased as much as 67 bpm. Cardiovascular changes were significantly greater during FM PPM relative to GM. Four subjects reported Almost-Loss of Consciousness symptoms during FM. While G-stress experienced by aircrew generated by current helicopters does not appear to present a high risk, 6 awareness training is recommended to reduce risks to aircrew exposed to G-loads generated by more aggressive helicopters. Future studies are required to determine the impact of longer mission times and dehydration.
DTIC

Helicopters; Human Reactions; Human Tolerances; Flight Crews; Physiological Effects; Acceleration Tolerance; Flight Simulation

20000075969 Naval Postgraduate School, Monterey, CA USA
An Interactive Virtual Environment for Training Map-Reading Skill in Helicopter Pilots
McLean, Timothy D.; Sep. 1999; 121p; In English
Report No.(s): AD-A378330; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Currently, Student Naval Aviators are trained to interpret 1:50,000 scale contour maps by watching VHS videotapes. These tapes show a helicopter moving about twice its normal speed over desert terrain. Primarily due to the lack of interactivity in these videos, students often make mistakes very early in the videotaped flight. The helicopter does not stop until the tape is over, hence, the training evolution quickly becomes useless because students usually make mistakes during the first minute of the tape and are unable to recover or to learn from those mistakes. Based on a previous study at the Naval Postgraduate School, a training system that utilizes virtual environment technology was developed that is compliant with the Information for the 21st Century (IT-21) initiative. The system was built using a Windows NT / Intel (Wintel) based computer along with three 24-inch monitors to train the tasks of map interpretation and terrain association. This desktop system was fielded at Helicopter Antisubmarine Squadron 10 (HS-10) for experimentation. Results of this experiment indicate that student pilots who received VE training performed the navigation task better in the helicopter than students who received only conventional training. Also, an IT-21 Wintel based computer is capable of rendering a graphically intensive multi-monitor application at frame rates suitable for training.
DTIC

Aircraft Pilots; Air Navigation; Virtual Reality; Computer Assisted Instruction; Pilot Training

20000080098 NASA Langley Research Center, Hampton, VA USA
Pilot Biofeedback Training in the Cognitive Awareness Training Study (CATS)
Uenking, M., NASA Langley Research Center, USA; [2000]; 8p; In English; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2000-4074; Copyright Waived; Avail: CASI; A02, Hardcopy; A01, Microfiche

One of the ongoing problems that pilots face today is a diminished state of awareness such as boredom, sleepiness, or fatigue during cruise conditions that could result in various pilot errors. This study utilized a cognitive training exercise to sharpen the pilot's awareness during simulated flight thereby providing them with a means to overcome these diminished states of awareness. This study utilizes psychophysiological methods in an attempt to assess a pilot's state of awareness more directly. In turn, the pilots will be able to train themselves to recognize these states of awareness and be more mentally sharp during mundane tasks such as

those experienced in cruise conditions. The use of these measurement tools may be beneficial for researchers working within the NASA Aviation Safety Program. This paper will provide the reader with some background information concerning the motivation for the study, a brief description of the experimental setup and design matrix, the dependent and independent variables that were employed, and some preliminary findings based on some of the subjective and objective data that was collected. These preliminary findings are of part of an ongoing study being conducted at the NASA Langley Research Center in Hampton, Virginia.
Author
Pilot Training; Aviation Psychology; Aircraft Pilots; Biofeedback; Flight Simulators; Training Devices

15
MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

Includes general topics and overviews related to mathematics and computer science.

20000074078 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Flight Validation of On-Demand Operations: The Deep Space One Beacon Monitor Operations Experiment
Wyatt, Jay, Jet Propulsion Lab., California Inst. of Tech., USA; Sherwood, Rob, Jet Propulsion Lab., California Inst. of Tech., USA; Sue, Miles, Jet Propulsion Lab., California Inst. of Tech., USA; Szijjarto, John, Jet Propulsion Lab., California Inst. of Tech., USA; [2000]; 2p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

After a brief overview of the operational concept, this paper will provide a detailed description of the _as-flown_ flight software components, the DS1 experiment plan, and experiment results to date. Special emphasis will be given to experiment results and lessons learned since the basic system design has been previously reported. Mission scenarios where beacon operations is highly applicable will be described. Detailed cost savings estimates for a sample science mission will be provided as will cumulative savings that are possible over the next fifteen years of NASA missions.
Author
Flight Control; Deep Space; Beacons

20000076114 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
A Validation Assessment of the Storm Air-to-Air Prototype Algorithm
Pugh, David M.; Mar. 2000; 125p; In English
Report No.(s): AD-A378254; AFIT/GOA/ENS/00M-06; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

A validation assessment of the new STORM air-to-air prototype algorithm is accomplished using structural and output validation techniques. In the structural validation phase, the algorithms, code, and assumptions are evaluated to determine if the implementation of the model will match the intent of the designers. The components of the algorithm are compared to its predecessor, THUNDER, to evaluate if the prototype improves upon the weaknesses of THUNDER. In the output validation phase, the results of the model are evaluated to determine the extent to which the implementation of the model matches expected outcomes. Sensitivity analysis is presented to provide insight into the responsiveness of the algorithm to changes in aircraft performance. A two-level half-fraction factorial design with seven factors is used to determine the most significant factors.
DTIC
Aircraft Performance; Algorithms; Simulation

20000080023 Florida Univ., Dept. of Aerospace Engineering Mechanics and Engineering Science, Gainesville, FL USA
Parallel Computing of Overset Grids for Aerodynamic Problems with Moving Objects *Final Report, 1 Aug. 1995-31 Jul. 1999*
Prewitt, Nathan C., Florida Univ., USA; Jul. 31, 1999; 177p; In English
Contract(s)/Grant(s): F49620-98-1-0092
Report No.(s): AD-A378056; AFRL-SR-BL-TR-00-0201; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

When a store is dropped from a military aircraft at high subsonic, transonic, or supersonic speeds, the aerodynamic forces and moments acting on the store can be sufficient to send the store back into contact with the aircraft. This can cause damage to the aircraft and endanger the life of the crew. Therefore, store separation analysis is used to certify the safety of any proposed drop. This analysis is often based on wind tunnel aerodynamic data or analogy with flight test data from similar configurations. Time accurate computational fluid dynamics (CFD) offers the option of calculating store separation trajectories from first principles. In the Chimera grid scheme a set of independent, overlapping, structured grids are used to decompose the domain of interest. This allows the use of efficient structured grid flow solvers and associated boundary conditions, and allows for grid motion without

stretching or regridding. However, these advantages are gained in exchange for the requirement to establish communication links between the overlapping grids via a process referred to as "grid assembly".
DTIC
Aerodynamic Forces; Computational Fluid Dynamics; Computational Grids; Parallel Processing (Computers); Wind Tunnel Tests; Trajectories

20000076113 Air Force Inst. of Tech., School of Engineering, Wright-Patterson AFB, OH USA
Feature Selection for Predicting Pilot Mental Workload
East, Julia A.; Mar. 21, 2000; 140p; In English
Report No.(s): AD-A378241; AFIT/GOR/ENS/00M-09; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Advances in technology have the cockpits of the aircraft in the Air Force inventory increasingly complex. Consequently, mental demands on the pilot have risen. In some cases, mental demands were so overwhelming that pilots have forgotten basic flying techniques, such as G-straining maneuvers. The results have been fatal. Recent research in this area has involved collecting psychophysiological features, such as electroencephalography (EEG), heart, eye and respiration measures, in an attempt to identify pilot mental workload. This thesis focuses on feature selection and reduction of the psycophysiological features and subsequent classification of pilot mental workload on multiple subjects over multiple days. A stepwise statistical technique and the signal-to-noise ratio (SNR) saliency metric were used to reduce the number of features required for classification. Factor analysis was used to compare the variables chosen by the discriminant procedure and the SNR metric as applied to a neural network. A total of 151 psychophysiological features were derived from data collected during an actual flight study. The original flight study contained three workload levels, low, medium and high. These levels were aggregated into two categories of pilot mental workload, low/medium and high. Mental workload associated with each flight segment was determined by difficult of task.
DTIC
Mental Performance; Workloads (Psychophysiology); Neural Nets; Cockpits; Psychophysiology

16
PHYSICS (GENERAL)

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics.

20000070855 Harris, Miller, Miller and Hanson, Inc., Burlington, MA USA
Examining INM Accuracy Using Empirical Sound Monitoring and Radar Data
Miller, Nicholas P., Harris, Miller, Miller and Hanson, Inc., USA; Anderson, Grant S., Harris, Miller, Miller and Hanson, Inc., USA; Horonjeff, Richard D., Harris, Miller, Miller and Hanson, Inc., USA; Kimura, Sebastian, Harris, Miller, Miller and Hanson, Inc., USA; Miller, Jonathan S., Harris, Miller, Miller and Hanson, Inc., USA; Senzig, David A., Harris, Miller, Miller and Hanson, Inc., USA; Thompson, Richard H., Harris, Miller, Miller and Hanson, Inc., USA; April 2000; 138p; In English
Contract(s)/Grant(s): NAS1-20102; RTOP 538-03-15-01
Report No.(s): NASA/CR-2000-210113; NAS 1.26:210113; HMMH-294520.03; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Aircraft noise measurements were made using noise monitoring systems at Denver International and Minneapolis St. Paul Airports. Measured sound exposure levels for a large number of operations of a wide range of aircraft types were compared with predictions using the FAA's Integrated Noise Model. In general it was observed that measured levels exceeded the predicted levels by a significant margin. These differences varied according to the type of aircraft and also depended on the distance from the aircraft. Many of the assumptions which affect the predicted sound levels were examined but none were able to fully explain the observed differences.
Author
Aircraft Noise; Noise Measurement; Radar Data; Monitors; Meteorological Parameters; Mathematical Models

20000075259 NASA Langley Research Center, Hampton, VA USA
Noise Prediction for Maneuvering Rotorcraft
Brentner, Kenneth S., NASA Langley Research Center, USA; Jones, Henry E., Army Aviation and Missile Command, USA; [2000]; 14p; In English; 6th; 6th Aeroacoustics Conference, 12-14 Jun. 2000, Lahaina, HI, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations
Report No.(s): AIAA Paper 2000-2031; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper presents the initial work toward first-principles noise prediction for maneuvering rotors. Both the aeromechanical and acoustics aspects of the maneuver noise problem are discussed. The comprehensive analysis code, CAMRAD 2. was utilized to predict the time-dependent aircraft position and attitude, along - with the rotor blade airloads and motion. The major focus of this effort was the enhancement of the acoustic code WOPWOP necessary to compute the noise from a maneuvering rotorcraft. Full aircraft motion, including arbitrary transient motion, is modeled together with arbitrary rotor blade motions. Noise from a rotorcraft in turning and descending flight is compared to level flight. A substantial increase in the rotor noise is found both for turning flight and during a transient maneuver. Additional enhancements to take advantage of parallel computers and clusters of workstations, in addition to a new compact-chordwise loading formulation, are also described.
Author
Noise Prediction; Rotary Wing Aircraft; Acoustics; Aerodynamic Noise; Turning Flight

20000080071 Missouri Univ., Mechanical and Aerospace Engineering and Engineering Mechanics, Rolla, MO USA
Turbofan Acoustic Propagation and Radiation *Final Report*
Eversman, Walter, Missouri Univ., USA; June 20000; 203p; In English
Contract(s)/Grant(s): NAG3-2109; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

This document describes progress in the development of finite element codes for the prediction of near and far field acoustic radiation from the inlet and aft fan ducts of turbofan engines. The report consists of nine papers which have appeared in archival journals and conference proceedings, or are presently in review for publication. Topics included are: 1. Aft Fan Duct Acoustic Radiation; 2. Mapped Infinite Wave Envelope Elements for Acoustic Radiation in a Uniformly Moving Medium; 3. A Reflection Free Boundary Condition for Propagation in Uniform Flow Using Mapped Infinite Wave Envelope Elements; 4. A Numerical Comparison Between Multiple-Scales and FEM Solution for Sound Propagation in Lined Flow Ducts; 5. Acoustic Propagation at High Frequencies in Ducts; 6. The Boundary Condition at an Impedance Wall in a Nonuniform Duct with Potential Flow; 7. A Reverse Flow Theorem and Acoustic Reciprocity in Compressible Potential Flows; 8. Reciprocity and Acoustics Power in One Dimensional Compressible Potential Flows; and 9. Numerical Experiments on Acoustic Reciprocity in Compressible Potential Flows.
Derived from text
Turbofans; Turbofan Engines; Acoustic Propagation; Sound Waves; Noise Prediction (Aircraft)

17
SOCIAL AND INFORMATION SCIENCES (GENERAL)

Includes general research topics related to sociology; educational programs and curricula.

20000073398 BAE Systems, UK
Monitoring and Intelligent Use of Data 'Turning Water into Wine': Proceedings
[2000]; 104p; In English; Monitoring and Intelligent Use of Data 'Turning Water into Wine', 28 Mar. 2000, London, UK; Sponsored by Royal Aeronautical Society, UK; See also 20000073399 through 20000073406; Original contains color illustrations; ISBN 1-85768-182-7; Copyright; Avail: Issuing Activity

Not long after Stewart Hughes Ltd (SHL) started to install FDR/HUM systems on North Sea helicopters (circa 1990), thoughts began to gel on how better use could be made of what was undoubtedly an expensive and heavy system. In particular, that having fitted such a powerful system for the gathering and processing of flight as well as health data, perhaps now was the time to think seriously about helping the pilots, as opposed to the original 'benefactor', i.e. the maintainer. The HARP report of the early 1980s had put cockpit problems at the top of the list for help, but at some later point the decision was made to put the then scarce R&D resources behind the less intractable problem of mechanical health monitoring. Even to this day, the aircraft's crew perform a largely 'postman' type of service for HUM, gaining little or no direct benefit, and this somewhat conflicts with accident statistics that place the crew at the forefront of accident causes. It therefore suggests that a system aimed principally at improving safety, and one so computationally powerful and data intensive as the HUM, should try to do more to help the crew. Hence, from an early time, the idea of using HUM data to generate pilot alerts arose. In the beginning, this centred round fairly simple functions such as the calculation of low airspeeds, aircraft weight, CG and range, all based purely on use of FDR data. Latterly, however, we have seen more sophisticated functions being suggested. For example, to do with the vortex ring state (VRS) - essentially a low airspeed/high descent rate/pilot disorientation type of phenomenon - where pilots may have, for example, turned tail into wind, become entangled in VRS and lost control. Such states are also sometimes experienced by pilots executing a steep descent, or turning into a landing site and unconsciously transferring their airspeed reference from that of the airmass to some fixed position on the ground. Added to this, the HUM data was proving difficult to interpret in anything but the simplest of scenarios.

In hindsight many possible causes for this can be given: lack of training, inevitable immaturities in the systems and just the sheer number of failure modes that some of the HUM systems were set up to monitor. However, for SHL systems at least, it was fundamentally to do with the problem of setting thresholds for vibration measurements.
Derived from text
Aircraft Pilots; Cockpits; Disorientation; Education; Failure Modes; Health; Vibration Measurement

20000073400 Rolls-Royce Ltd., Strategic Research Centre, Derby, UK
Intelligent Management of Engine Data
Cowley, Peter, Rolls-Royce Ltd., UK; Hesketh, Graham, Rolls-Royce Ltd., UK; Monitoring and Intelligent Use of Data 'Turning Water into Wine': Proceedings; [2000], pp. 3.1 - 3.4; In English; See also 20000073398; Copyright; Avail: Issuing Activity

Rolls-Royce has supplied its customers with the COMPASS data collection system for many years. The information from these systems has been analysed by our Airline customers using trending and manual inspection of performance charts by skilled engineers. Small operators have had some difficulty in benefiting from the information collected by their data collection systems. They lack large, fleet wide databases from which to build case history libraries and they may have difficulty supporting the manpower needed to inspect the trend charts produced. Recently, Rolls-Royce has set up a joint venture company with Science Applications International Corporation. The new company, Data Systems and Solutions is providing a data handling and analysis service for operators. This not only makes detailed operational data analysis available to smaller operators, but allows all operators to benefit from Rolls-Royce detailed knowledge of engine design and performance. Rolls-Royce benefits too in obtaining objective engine reliability data. Rolls-Royce Strategic Research Centre has been developing novelty detection systems for monitoring engine health and indeed for monitoring manufacturing and business processes. These systems are targeted at future engine designs and at engine development testing, but it has become clear that the methods we have been using may also be applied to COMPASS data. The benefits of doing this are two fold. Firstly, the routine scanning of the large volume of data collected can be delegated to novelty detection software. Secondly, flight to flight variation in the parameters being trended can be substantially reduced which allows changes in the trend to be identified earlier and with increased confidence.
Author
Data Acquisition; Data Systems; Collection; Procedures; Manuals; Flight Characteristics; Airline Operations

20000073404 British Airways, Heathrow, UK
Operational Data Monitoring: Experiences Good and Bad
Savage, John, British Airways, UK; Monitoring and Intelligent Use of Data 'Turning Water into Wine': Proceedings; [2000], pp. 9.1 - 9.3; In English; See also 20000073398; Copyright; Avail: Issuing Activity

The purpose of this paper is to give a practical view of what can be done in Operational Flight Data Monitoring using current technology. Although many of the illustrations I will give come from the British Airways OFDM programme, I hope to make my main points more general i.e. they apply equally to any OFDM programme. Throughout I will emphasise areas of difficulty, and how important it is to overcome them.
Author
Data Processing; Data Management; Flight Characteristics

20000073405 Stewart Hughes Ltd., Southhampton, UK
A Trial Helicopter Operations Monitoring Programme (HOMP)
Larder, Brian, Stewart Hughes Ltd., UK; Norman, Nick, Bristow Helicopters Ltd., UK; Monitoring and Intelligent Use of Data 'Turning Water into Wine': Proceedings; [2000], pp. 10.1 - 10.8; In English; See also 20000073398; Copyright; Avail: Issuing Activity

In recent years advances in technical safety of large helicopters have been achieved through the implementation of Health and Usage Monitoring Systems (HUMS). These systems have provided improved information on the integrity of the helicopter powertrain. All HUM systems have been introduced on the back of a mandatory requirement to fit Flight Data Recorders (FDRs). Until now, however, the flight data stored in the FDRs has only been used in a reactive manner for the analysis of incidents and accidents. Many airlines operating fixed wing aircraft have adopted a pro-active approach to improving operational safety by analysing flight data on a routine basis to provide better visibility of their operations. This paper describes the trial of a helicopter version of this approach, known as a Helicopter Operations Monitoring Programme (HOMP), with the goal of further improving helicopter operational safety by making better use of the existing FDR data.
Author
Airline Operations; Commercial Aircraft; Flight Recorders; Helicopters; Safety

20000073406 British Airways, UK

Royal Aeronautical Society Conference Monitoring and Intelligent Use of Data: Turning Water into Wine. Analysing and Presenting HOMP Data

Rogan, Eddie, British Airways, UK; Monitoring and Intelligent Use of Data 'Turning Water into Wine': Proceedings; [2000], pp. 11.1 - 11.9; In English; See also 20000073398; Original contains color illustrations; Copyright; Avail: Issuing Activity

British Airways (BA) started using flight data recorders nearly 40 years ago and for the last 30 years all its pilots have taken for granted that their operations have been recorded and analysed by an exceedence program. For the last ten years all of the British Airways flight data collected has been analysed and presented as useful information using several BASIS (British Airways Safety Information System) modules. The BASIS suite of Flight Data modules was chosen for the Helicopter Operations Monitoring Programme (HOMP) trial to extract, decode, analyse and present flight data information stored on the trial QARs (Quick Access Recorders). This paper describes how the BASIS Flight Data modules used in the trial turn raw flight data from the recorder of a Helicopter into useful information that can be analysed and presented on the ground.

Author

Safety; Information Systems; Helicopters; Flight Recorders

19
GENERAL

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs such as Apollo, Gemini, and Mercury spacecraft, Earth Resources Technology Satellite (ERTS), and Skylab; NASA appropriations hearings.

20000080110 NASA Dryden Flight Research Center, Edwards, CA USA

Research Engineering ***Annual Report, 1999***

Hamlin, Edmund, Compiler, NASA Dryden Flight Research Center, USA; Cruciani, Everlyn, Compiler, NASA Dryden Flight Research Center, USA; Pearson, Patricia, Compiler, NASA Dryden Flight Research Center, USA; August 2000; 40p; In English; Original contains color illustrations

Contract(s)/Grant(s): RTOP 529-50-04-MI-00-RR

Report No.(s): NASA/TM-2000-209026; H-2413; NAS 1.15:209026; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Selected research and technology activities at Dryden Flight Research Center are summarized. These activities exemplify the Center's varied and productive research efforts.

Author

Research and Development; Aerodynamics; Flight Control; Propulsion; Aircraft Structures; Flight Tests; Aircraft Instruments; Flight Characteristics

Subject Term Index

A

ACCELERATION TOLERANCE, 35
ACCIDENT PREVENTION, 11
ACOUSTIC PROPAGATION, 38
ACOUSTICS, 38
ACTIVE CONTROL, 4
AERIAL RECONNAISSANCE, 20, 25
AEROACOUSTICS, 7
AERODYNAMIC CHARACTERISTICS, 5, 6
AERODYNAMIC COEFFICIENTS, 3
AERODYNAMIC DRAG, 6
AERODYNAMIC FORCES, 4, 37
AERODYNAMIC HEATING, 30
AERODYNAMIC LOADS, 4
AERODYNAMIC NOISE, 38
AERODYNAMIC STALLING, 33
AERODYNAMICS, 1, 2, 3, 5, 40
AEROELASTICITY, 26, 32
AEROSPACE ENGINEERING, 2
AEROSPACE VEHICLES, 5
AEROSPIKE ENGINES, 28
AH–64 HELICOPTER, 21
AIR CARGO, 15
AIR DROP OPERATIONS, 13
AIR NAVIGATION, 14, 35
AIR TO AIR REFUELING, 13
AIR TRAFFIC, 8, 14
AIR TRAFFIC CONTROL, 11, 14
AIR TRAFFIC CONTROLLERS (PERSONNEL), 14
AIR TRANSPORTATION, 8, 10, 12, 13
AIRBORNE/SPACEBORNE COMPUTERS, 28
AIRCRAFT ACCIDENTS, 10, 11, 14
AIRCRAFT COMMUNICATION, 2
AIRCRAFT CONSTRUCTION MATERIALS, 23
AIRCRAFT CONTROL, 1, 34
AIRCRAFT DESIGN, 34
AIRCRAFT DETECTION, 21
AIRCRAFT EQUIPMENT, 25, 32
AIRCRAFT INDUSTRY, 8, 21
AIRCRAFT INSTRUMENTS, 2, 33, 40
AIRCRAFT MAINTENANCE, 1, 2, 13, 21, 27
AIRCRAFT MODELS, 23, 26
AIRCRAFT NOISE, 4, 37
AIRCRAFT PARTS, 34
AIRCRAFT PERFORMANCE, 36
AIRCRAFT PILOTS, 11, 35, 36, 39
AIRCRAFT PRODUCTION, 23
AIRCRAFT RELIABILITY, 23
AIRCRAFT SAFETY, 11, 12, 15
AIRCRAFT STABILITY, 2
AIRCRAFT STRUCTURES, 22, 34, 40
AIRFOIL PROFILES, 3
AIRFOILS, 34
AIRLINE OPERATIONS, 8, 9, 10, 39
AIRPORTS, 7, 9, 10, 14
ALGORITHMS, 19, 25, 36
ANGULAR VELOCITY, 28
ANTARCTIC REGIONS, 17
ARMED FORCES (UNITED STATES), 14
ARTIFICIAL SATELLITES, 29
ASTRONOMICAL OBSERVATORIES, 17
ATMOSPHERIC BOUNDARY LAYER, 16
ATMOSPHERIC MOISTURE, 34
AUTONOMY, 17
AVIATION PSYCHOLOGY, 36
AVIONICS, 30

B

BALLUTES, 30
BEACONS, 36
BIBLIOGRAPHIES, 2
BIOFEEDBACK, 36
BOEING 767 AIRCRAFT, 24
BOUNDARY LAYER CONTROL, 7
BOUNDARY LAYER SEPARATION, 32
BOUNDARY LAYER TRANSITION, 7
BUFFETING, 23
BUOYANCY, 30

C

CARBON DIOXIDE, 31
CH–46 HELICOPTER, 6
CHINA, 8
CIVIL AVIATION, 8, 9
CLIMATE MODELS, 34
COCKPITS, 37, 39
COLLECTION, 39
COMBUSTION, 31
COMMERCIAL AIRCRAFT, 39
COMMUNICATION NETWORKS, 12
COMPRESSIBLE FLOW, 32
COMPUTATION, 28
COMPUTATIONAL FLUID DYNAMICS, 5, 6, 37
COMPUTATIONAL GRIDS, 37
COMPUTER ASSISTED INSTRUCTION, 35
COMPUTER PROGRAMS, 17, 22
COMPUTERIZED SIMULATION, 12, 15, 31, 32
CONGRESSIONAL REPORTS, 10, 23
CONTROL SURFACES, 1
CONTROL SYSTEMS DESIGN, 26
CONVECTION, 34
COORDINATES, 18
COST ANALYSIS, 13
COST REDUCTION, 21, 23
COSTS, 9
CRACK GEOMETRY, 27
CRACK PROPAGATION, 27
CRACK TIPS, 27
CRACKS, 27
CRASHWORTHINESS, 15

D

DAMAGE, 23
DAMAGE ASSESSMENT, 15
DATA ACQUISITION, 39
DATA BASES, 2, 7
DATA MANAGEMENT, 39
DATA PROCESSING, 7, 17, 22, 39
DATA SIMULATION, 22
DATA SYSTEMS, 39
DATA TRANSMISSION, 12
DC 8 AIRCRAFT, 34
DECISION MAKING, 11
DEEP SPACE, 36
DEFENSE PROGRAM, 14
DELIVERY, 15
DEPLOYMENT, 15
DESIGN ANALYSIS, 15, 34
DISORIENTATION, 6, 39
DISPLACEMENT, 28
DOPPLER RADAR, 32, 34
DRAG, 24
DRAG DEVICES, 30
DYNAMIC CHARACTERISTICS, 24
DYNAMIC PRESSURE, 33
DYNAMIC STABILITY, 28

E

EARTH OBSERVATIONS (FROM SPACE), 16
ECONOMIC DEVELOPMENT, 8, 10
ECONOMICS, 8
EDUCATION, 39
ELECTRIC ARCS, 21
ENERGY DISSIPATION, 16
ENGINE DESIGN, 31
ENGINE FAILURE, 28
ENVIRONMENT MANAGEMENT, 21
ERROR ANALYSIS, 26
ERROR CORRECTING CODES, 26
EUROPE, 9, 10
EVALUATION, 27

F

F–15 AIRCRAFT, 23
F–16 AIRCRAFT, 7
F–18 AIRCRAFT, 26
F–22 AIRCRAFT, 23
FAILURE MODES, 39
FATIGUE (MATERIALS), 23
FEEDBACK CONTROL, 26, 28, 29
FINITE DIFFERENCE THEORY, 28
FINITE ELEMENT METHOD, 25, 32
FIRE PREVENTION, 23
FIXED WINGS, 5
FLAMMABILITY, 21, 23
FLAPPING, 32
FLAPS (CONTROL SURFACES), 32
FLIGHT CHARACTERISTICS, 24, 39, 40
FLIGHT CONDITIONS, 11, 22, 26
FLIGHT CONTROL, 28, 29, 36, 40
FLIGHT CREWS, 35
FLIGHT LOAD RECORDERS, 24
FLIGHT PATHS, 14
FLIGHT RECORDERS, 39, 40
FLIGHT SAFETY, 11, 12, 19
FLIGHT SIMULATION, 31, 35
FLIGHT SIMULATORS, 13, 26, 36
FLIGHT TEST VEHICLES, 24
FLIGHT TESTS, 15, 22, 26, 28, 33, 40
FLIGHT TRAINING, 11, 12, 13
FLOATS, 30
FLOW DISTRIBUTION, 6
FLUID PRESSURE, 25
FRACTURE STRENGTH, 27
FRACTURING, 27
FRENCH SATELLITES, 16
FULL SCALE TESTS, 21

G

GALILEO SPACECRAFT, 18
GAS TURBINE ENGINES, 31
GENERAL AVIATION AIRCRAFT, 12
GEODESY, 17, 29
GEODYNAMICS, 18
GEOPHYSICAL OBSERVATORIES, 29
GLASS FIBERS, 21
GLIDING, 24
GLOBAL POSITIONING SYSTEM, 3, 17, 18, 19
GROUND BASED CONTROL, 34

H

HANDBOOKS, 23
HARMONIC CONTROL, 4
HARRIER AIRCRAFT, 10
HEALTH, 39
HELICOPTER PERFORMANCE, 22, 23
HELICOPTERS, 4, 13, 14, 21, 23, 35, 39, 40
HEURISTIC METHODS, 13, 25
HIGH SPEED, 26
HORIZONTAL FLIGHT, 4
HUMAN BEINGS, 6
HUMAN REACTIONS, 35
HUMAN TOLERANCES, 35
HURRICANES, 34
HYDRAULIC EQUIPMENT, 25
HYPERSONIC FLIGHT, 6
HYSTERESIS, 33

I

ICE FORMATION, 1, 15
IDENTIFYING, 18
IMAGING TECHNIQUES, 33
IMPACT TESTS, 15
INCOMPRESSIBLE FLOW, 7
INDIA, 9
INDUSTRIES, 8, 9
INFLATABLE STRUCTURES, 30
INFORMATION DISSEMINATION, 11
INFORMATION MANAGEMENT, 14
INFORMATION SYSTEMS, 40

J

JAPAN, 9
JAS–39 AIRCRAFT, 28

K

KALMAN FILTERS, 19
KINETIC ENERGY, 16
KOREA, 8

L

LAMINAR BOUNDARY LAYER, 7
LAMINAR FLOW, 7
LAMINAR FLOW AIRFOILS, 1
LANDING GEAR, 24
LIFE (DURABILITY), 22
LIFE CYCLE COSTS, 21
LIFE SCIENCES, 2
LITHIUM BATTERIES, 32
LOADS (FORCES), 24
LOW EARTH ORBITS, 19, 30

M

MAGNETOMETERS, 19
MANAGEMENT SYSTEMS, 1
MANUALS, 39
MANUFACTURING, 20
MARKET RESEARCH, 9, 10
MATHEMATICAL MODELS, 15, 22, 37
MEASURING INSTRUMENTS, 5, 7
MENTAL PERFORMANCE, 37
METEOROLOGICAL PARAMETERS, 37
MICROELECTROMECHANICAL SYSTEMS, 31
MICROGRAVITY, 30
MILITARY TECHNOLOGY, 14
MONITORS, 37
MONTE CARLO METHOD, 14
MULTIDISCIPLINARY RESEARCH, 18

N

NATIONAL AIRSPACE SYSTEM, 19
NAVIGATION, 19
NAVIGATION AIDS, 14
NAVIGATION SATELLITES, 19
NEURAL NETS, 37
NOISE MEASUREMENT, 37
NOISE PREDICTION, 38
NOISE PREDICTION (AIRCRAFT), 38
NOISE REDUCTION, 4
NONDESTRUCTIVE TESTS, 20
NONLINEARITY, 5
NUMERICAL ANALYSIS, 6

O

OPERATING COSTS, 30

P

PARABOLIC ANTENNAS, 17
PARACHUTES, 3
PARALLEL PROCESSING (COMPUTERS), 37
PAYLOADS, 3, 30
PHASE SHIFT KEYING, 12
PHOTOCHEMICAL REACTIONS, 34
PHYSIOLOGICAL EFFECTS, 35
PHYSIOLOGICAL FACTORS, 6
PIEZOELECTRIC TRANSDUCERS, 20
PILOT ERROR, 12
PILOT PERFORMANCE, 22
PILOT TRAINING, 12, 35, 36
PILOTLESS AIRCRAFT, 20, 21, 25
PLANETARY ATMOSPHERES, 30
POLICIES, 8, 9, 10
POROSITY, 6
POSITIONING, 16
PRESSURE MEASUREMENT, 3, 6, 25
PROCEDURES, 14, 39
PRODUCT DEVELOPMENT, 32
PRODUCTION COSTS, 23
PRODUCTION MANAGEMENT, 28
PROPULSION, 40
PSYCHOPHYSIOLOGY, 37
PULSE REPETITION RATE, 18

Q

QUALITATIVE ANALYSIS, 28
QUALITY CONTROL, 2

R

RADAR DATA, 37
RADAR DETECTION, 18
RADIO COMMUNICATION, 12
RADIO RECEIVERS, 17
RADIO TELESCOPES, 17
RADIOMETERS, 33
RAMPS (STRUCTURES), 26
REAL TIME OPERATION, 3
RECONNAISSANCE, 25
RECONNAISSANCE AIRCRAFT, 20
RECORDERS, 22
REGIONS, 10
REGRESSION ANALYSIS, 15
REGULATIONS, 9, 14, 23
RELIABILITY ANALYSIS, 2
REMOTE SENSING, 32, 34
REMOTELY PILOTED VEHICLES, 20
RESCUE OPERATIONS, 13
RESEARCH, 30
RESEARCH AIRCRAFT, 15
RESEARCH AND DEVELOPMENT, 40
RESEARCH VEHICLES, 26
RIGID WINGS, 5
ROCKET ENGINE CASES, 31
ROCKET ENGINES, 31
ROCKET–BASED COMBINED–CYCLE ENGINES, 30
ROTARY WING AIRCRAFT, 38
ROTARY WINGS, 23
ROTATION, 28
ROTOR AERODYNAMICS, 23
ROTORS, 23, 33
ROUTES, 25
RUNWAYS, 14

S

SAFETY, 2, 39, 40
SATELLITE NAVIGATION SYSTEMS, 19
SATELLITE ORIENTATION, 19
SCALE MODELS, 3
SENSORS, 7
SIGNAL DETECTION, 18
SIMULATION, 12, 15, 26, 36
SKID LANDINGS, 24
SKIDDING, 24
SKIS, 26
SOFTWARE ENGINEERING, 26
SOLAR GENERATORS, 17
SOLID PROPELLANT ROCKET ENGINES, 31
SOUND WAVES, 38
SPACE BASED RADAR, 32
SPACECRAFT DESIGN, 30
SPACECRAFT PROPULSION, 31
SPATIAL DISTRIBUTION, 6
STABILITY DERIVATIVES, 28
STATISTICAL ANALYSIS, 25
STEADY STATE, 28
STOVL AIRCRAFT, 26
STRAIN GAGES, 25
STRUCTURAL ANALYSIS, 22
STRUCTURAL DESIGN, 34
STRUCTURAL FAILURE, 27
STRUCTURAL STABILITY, 27
SUPERSONIC FLOW, 7, 32
SUPERSONIC INLETS, 32
SUPERSONIC SPEED, 5, 6, 26
SURFACE CRACKS, 27
SURFACE VEHICLES, 20
SURVEILLANCE RADAR, 18
SYNTHETIC APERTURES, 33
SYSTEM IDENTIFICATION, 26
SYSTEMS ENGINEERING, 20

T

TAKEOFF, 26
TANKER AIRCRAFT, 13
TARGET ACQUISITION, 21
TELECOMMUNICATION, 12
TENSILE STRESS, 27
TERMINOLOGY, 14
THERMAL INSULATION, 21
THREE DIMENSIONAL FLOW, 2, 33
THRUST, 22
TORQUE, 22
TOTAL QUALITY MANAGEMENT, 1
TRAINING DEVICES, 12, 36
TRAJECTORIES, 37
TRANSPIRATION, 32
TRANSPORT AIRCRAFT, 27
TRAVELING SALESMAN PROBLEM, 25
TURBOFAN ENGINES, 38
TURBOFANS, 38
TURBULENCE, 16
TURBULENT BOUNDARY LAYER, 16, 32
TURBULENT FLOW, 3
TURNING FLIGHT, 38

U

U–2 AIRCRAFT, 32, 34
UH–1 HELICOPTER, 15
UH–60A HELICOPTER, 14, 22
ULTRAHIGH FREQUENCIES, 33
ULTRASONIC WAVE TRANSDUCERS, 20
ULTRASONICS, 20
UNDERWATER VEHICLES, 20
UNSTEADY AERODYNAMICS, 5, 6
UNSTEADY FLOW, 2, 5, 6

V

V–22 AIRCRAFT, 21
VERY LONG BASE INTERFEROMETRY, 17, 29
VIBRATION, 4
VIBRATION DAMPING, 4
VIBRATION MEASUREMENT, 39
VIRTUAL REALITY, 35
VISCOUS FLOW, 2
VORTICES, 6

W

WEATHER, 11
WIND DIRECTION, 6
WIND MEASUREMENT, 3

WIND TUNNEL MODELS, 23
WIND TUNNEL TESTS, 3, 5, 6, 23, 37
WIND TUNNELS, 5
WIND TURBINES, 34
WIND VELOCITY, 3
WING LOADING, 26
WING PROFILES, 1
WORKLOADS (PSYCHOPHYSIOLOGY), 37

X

X–33 REUSABLE LAUNCH VEHICLE, 28
X–38 CREW RETURN VEHICLE, 24

Personal Author Index

A

Aagaard Madsen, H., 33
Adams, Gregory A., 13
Amimoto, S., 30
Andersen, Per Helge, 17
Anderson, Grant S., 37
Antoniou, I., 3
Arya, S. Pal, 15
Atlas, E., 34
Awaya, Henry, 16

B

Bainum, Peter M., 29
Bak, C., 3
Baker, John W., 31
Bar–Itzhack, Itzhack Y., 19
Barboka, James, 30
Bartels, Robert E., 5
Bennett, Robert M., 5
Bergstrand, Sten, 17
Beutler, G., 18
Boeer, Armin, 29
Bowen, Brent D., 7
Bragg, M. B., 1
Brand, A., 33
Brenneman, Stephen K., 1
Brentner, Kenneth S., 37
Brown, B., 30
Brown, Susan M., 11
Browne, Ken S., 15
Bruining, A., 33

C

Cahill, P., 21
Capehart, Shay R., 12
Carter, John F., 28
Carver, K., 32
Chase, Eric T., 13
Chorney, Andrew, 25
Cole, Julian D., 6
Cowley, Peter, 39
Cruciani, Everlyn, 40

D

Dace, Gregory, 16
Dahl, K. S., 33
Daugherty, Robert H., 24
Deng, Z. T., 30
Deutschmann, Julie, 19
Dong, M., 7
Donnellan, Andrea, 16
Donnellon, Gregory R., 26
Dube, Maurice, 16
Dutton, Craig, 32

E

East, Julia A., 37
Eckert, Clifford A., 11
Edwards, John W., 5
Erickson, Gary E., 5, 6
Eversman, Walter, 38

F

Ferman, Marty A., 23
Fournier, E., 30
Fries, Joseph, 23
Fuglsang, P., 3, 33

G

Gafka, George K., 24
Gallan, Roger D., Jr, 14
Gandhi, Farhan, 3
Geerts, B., 34
Geubelle, Philippe, 32
Gimmestad, Gary G., 11
Goodberlet, M., 32
Graham, Brian, 9
Graham, M., 33
Green, Lawrence L., 28
Greenberg, J., 34

H

Haas, Ruediger, 17
Hall, Charles E., 27
Hall, Jim, 11
Halverson, J., 34
Hamlin, Edmund, 40
Han, Jongil, 15
Harder, Robert W., 25
Harman, Rick, 19
Harris, Lawanna, 30
Hase, Hayo, 29
Hayhoe, G. F., 7
Hefner, Jerry N., 2
Hesketh, Graham, 39
Heymsfield, G. M., 34
Hillebrandt, Heather, 25
Hooper, Paul, 8
Hopkins, Wanda A., 20
Horner, A., 23
Horonjeff, Richard D., 37
Huebler, G., 34
Huston, Michael G., 26

I

Imhof, Greg, 26
Isaacs, Nathan D., 31

J

Jentink, H. W., 15
Johansson, Jan, 17
Johnson, Bill, 31
Jones, Henry E., 37

K

Keel, Byron M., 11
Khuri–Yakub, Butrus T., 19
Kim, Ki C., 22
Kimura, Sebastian, 37
Kinney, Gary W., Jr, 24
Kok, G., 34
Kolwey, Herman, 6
Kouba, J., 18
Kumar, Ajay, 2

L

Larder, Brian, 39
Lee, Yeong–Heok, 8
LeVine, D. M., 32
Lin, Yuh–Lang, 16
Lind, J., 34
Lisieqicz, John S., 20
Litchford, Ron J., 31
Loth, E., 1
Loth, Eric, 32
Lowe, Alvin B., 20
Luers, James K., 3
Luyendyk, Bruce, 16

M

Madsen, H. A., 3
Malnes, Eirik, 18
Marshall, Laurie A., 6
McGill, M., 32
McGuire, Michael, 20
McLean, Timothy D., 35
McRonald, Angus D., 29
McWethy, Robert W., 13
Mead, J., 32
Meling, John E., 21
Miller, Jonathan S., 37
Miller, Nicholas P., 37
Moore, A. W., 17
Morelli, Eugene A., 26
Murakami, Hideki, 9

N

Neilan, R., 18
Neilan, R. E., 17
Nesbit, William, 16
Noerkaer Soerensen, J., 7
Noll, Carey E., 16
Norman, Nick, 39
Norton, R., 34

O

Olney, Candida D., 25
Osborn, J., 30
Own, Tae Hoon, 7

P

Park, Michael A., 28
Pearson, Patricia, 40
Pedersen, Stein Inge, 18
Pettit, Richard Glen, 27
Popstefanija, I., 32
Prewitt, Nathan C., 36
Pugh, David M., 36

R

Rau, Russell A., 20
Rebold, Thomas, 16
Reed, Donald E., 20, 21
Reichenbach, Eric Y., 25
Reigber, C., 18
Reigber, Ch., 17
Ricci, Vittorio, 20
Richards, Mark A., 11
Ricker, Richard E., 26
Ridley, B., 34
Riepl, Stefan, 29
Rogan, Eddie, 40
Rojas–Oviedo, Ruben, 30
Rustenburg, J. H., 24
Rymer, J. W., 26
Ryzhov, Oleg S., 6

S

Sankhla, Chandra P., 26
Savage, John, 39
Schauffler, S., 34
Schlueter, Wolfgang, 29
Schork, Bill, 26
Schultz, Mike, 15
Schuster, David M., 5
Scott, Robert C., 5
Senzig, David A., 37
Shah, Pinakin M., 31
Shaohua, Shen, 15
Shender, Barry S., 35
Sherwood, Rob, 36
Short, Daniel R., 21
Shtessel, Yuri B., 27
Skinn, D. A., 24
Smith, Michael, 15
Snider, Jack D., 20
Sprague, Susan, 25
Springer, T., 18
Springer, T. A., 17
Staffelbach, T., 34
Stancil, Charles E., 11
Staniland, Martin, 10
Stavenjord, Kenneth H., 26
Stein, Brian J., 31
Stockton, Donald N., 21
Stoliker, P. C., 28
Strittmatter, Richard, 20
Strong, Avaine, 29
Sue, Miles, 36
Szijjarto, John, 36

T

Tan, Zhaozhi, 29
Thirstrup Petersen, J., 33
Thompson, Richard H., 37
Thurling, Andrew J., 22
Tian, L., 34
Tipps, D. O., 24
Tortorelli, Daniel, 32
Turner, Elijah W., 23

U

Uenking, M., 35
Ugweje, Okechukwu C., 12

V

Veldhuis, Jan, 9

W

Walega, J., 34
Ward, Charles, 20
Watt, Christopher J., 10
Wen Zhong Shen,, 7
White, Scott, 32
Wittlin, Gil, 15
Wyatt, Jay, 36
Wyte, David M., 21

Z

Zhang, Anming, 8

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (*Leave blank*)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	August 2000	Special Publication

4. TITLE AND SUBTITLE
Aeronautical Engineering
A Continuing Bibliography (Supplement 418)

5. FUNDING NUMBERS

6. AUTHOR(S)

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
NASA Scientific and Technical Information Program Office

8. PERFORMING ORGANIZATION REPORT NUMBER
NASA/SP-2000-7037/Suppl418

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
National Aeronautics and Space Administration
Langley Research Center
Hampton, VA 23681

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT
Subject Category: Distribution:
Availability: NASA CASI (301) 621-0390

12b. DISTRIBUTION CODE
Unclassified--Unlimited
Subject Category - 01

13. ABSTRACT *(Maximum 200 words)*
This report lists reports, articles and other documents recently announced in the NASA STI Database.

14. SUBJECT TERMS
Aeronautical Engineering
Aeronautics
Bibliographies

15. NUMBER OF PAGES
64

16. PRICE CODE
A04

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified		